

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Turlock Irrigation District

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and

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Project No. 2299

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Modesto Irrigation District

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2000 LOWER TUOLUMNE RIVER ANNUAL REPORT

Report 2000-5

1999-2000 Grayson Screw Trap Report

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1. Introduction

Declines in salmon stocks along the Pacific Coast, and particularly in the San Joaquin Valley, California, during the latter years of the last century have led to a surge of conservation and protective measures. Historically, California boasted strong pacific salmon stocks with runs consisting of winter run, spring run, fall run and late fall run chinook salmon (Yoshiyama, 2000). The Tuolumne River, California originates in the Sierra Nevada Mountains in Yosemite National Park. It runs down into the San Joaquin Valley and flows into the San Joaquin River (Figure 1.1). The Tuolumne River is reported as having spring and fall runs prior to the 1960's (as presented in Yoshiyama, 2000). However, overfishing, habitat loss and water quality degradation have led to the decline of chinook salmon stocks on the Tuolumne River. The Lower Tuolumne River has been severely impacted by the construction of dams, which impede fish passage, large scale historical gold dredging, in-channel gravel mining, and water withdrawals. The National Marine Fisheries Service (NMFS) currently lists the fall run chinook salmon as a candidate species for federal ESU listing. It is also thought to be the only remaining viable run on the Tuolumne River.

The Central Valley Project Improvement Act (CVPIA) requires the USFWS to take measures to restore native anadromous fisheries stocks to sustainable levels. A monitoring and assessment program was implemented to meet this requirement. The program is the Comprehensive Assessment and Monitoring Program (CAMP). The CDFG operates two rotary-screw traps on the Tuolumne River, one trap is provided by TID and MID, as part of the juvenile salmon monitoring component to CAMP. The monitoring is also a component of the Don Pedro FERC Settlement Agreement (Sections 13d,e,f,g).

Rotary-screw traps (RST's) are used in many studies of salmon along the Pacific Coast (Demko et al., 1999; Roper and Scarneccchia, 1996; Thedinga et al., 1994). RST's have been operated on the Tuolumne River near the confluence with the San Joaquin River since 1995 (Heyne and Loudermilk, 1997; 1998) and more recently, upstream in and below the primary spawning reach (Vick et al., 1998).

Several factors affect juvenile salmon migration rate and timing. Studies on the Columbia River indicate that the rate of migration (Giorgi et al., 1997; NMFS, 2000) and survival (NMFS, 2000) both increase with increasing flow. Previous studies on the Tuolumne River (Heyne and Loudermilk, 1997; 1998) present preliminary assessments of smolt survival and production using

rotary-screw traps. This paper attempts to expand the existing data by examining two subsequent years of sampling. The objectives of this study are to: 1) estimate the production of juvenile chinook salmon and 2) assess the timing of migration of fry and smolts during the 1999 and 2000 sampling periods.

2. Methods

2.1. Site Description

In 1999 and 2000 two rotary screw traps were operated in tandem at the Grayson River Ranch, approximately 5.2 river miles from the confluence of the San Joaquin River and the Tuolumne River (Fig. 2.1). No attempt was made to enhance trap efficiency by altering the river channel. In the summer of 2000 some riparian restoration efforts began on the Grayson River Ranch, but there have been no alterations to the channel. Restoration efforts did not begin until the end of the juvenile outmigration season. The traps were located upstream of the Shiloh Bridge anchored by a cable crossing the river. The north bank of this section of river is a steep riprap bank. The south bank has a gentle slope with heavy riparian vegetation. The substrate through this area is dominated by sand. The thalweg runs near the north bank.

2.2 Rotary Screw Traps and Operations

The rotary screw traps are eight feet diameter across the mouth of the traps. Approximately half of the cone is immersed and ‘fishing’. The structure of the traps is such that trap revolution increases with increasing velocity. Fish entering the mouth of the trap are directed towards a live well at the rear of the trap. One half revolution of the trap prevents any fish from exiting the mouth of the trap. The trapped fish are held in the live wells until a crew conducts a routine check.

Trap checks were performed on a daily basis, however, at the start of the 2000 season the traps were pulled (raised) so they did not sample on the weekends. Appendix I lists daily trap status. When the traps were pulled for the weekend they were raised after the Friday night check and lowered on Sunday afternoon. At the start of each season checks were performed twice a day, once salmon began appearing or flows increased the number of checks per day was increased to three checks a day. The check schedule was designed to minimize the time between checks,

particularly over night, to reduce the likelihood of debris fouling the trap and increase effective 'fishing' time.

In 1999 the traps were deployed on 12 January and checks were conducted daily. Two daily checks were conducted from 13 January through 09 February. Three daily checks began on 10 February 1999. The survey concluded on 06 June.

The traps were deployed on 09 January 2000 for the 2000 outmigrant season. Two daily checks were conducted five days a week until 13 February 2000 when the traps began operating seven days a week. A schedule of three checks a day began on 02 March 2000. The survey concluded on 12 June 2000.

Each trap check consisted of fish capture data, environmental variable data, and trap operation data. Upon arrival at the traps the crew measured the revolutions per minute (RPM's) of the trap and recorded the total revolutions for the sample period. Air and water temperature ($^{\circ}\text{C}$) was recorded and conductivity (μs) was measured with a Cole-Palmer CON 5 conductivity meter. Turbidity (NTU) was measured with a Hach portable turbidity meter. The average of three velocity measurements (ms^{-1}) was recorded for each trap. The velocity was taken at a depth of 0.5 m at the mouth of each trap using a Marsh-McBurney flow meter. After all fish were removed from the live wells and the trap was cleared of debris RPM's was recorded.

All fish in the live wells were removed and recorded for each respective trap. Salmon were identified and checked for marks. Marks may include an adipose fin clip, indicating a coded wire tag (hereafter referred to as CWT), other fin clips, a dye mark on the caudal, dorsal, or anal fins, and freeze brands. All marked salmon were measured to the nearest millimeter fork length and the mark code was recorded. Unmarked (naturally produced) chinook salmon captures during peak periods of movement were often times in excess of 500 specimens. For this reason a representative sample of 100 juvenile salmon specimens per check was measured to the nearest millimeter (fork length) and the remainder was enumerated and recorded for each trap check. The number in excess of the 100 measured specimens will henceforth be referred to as a plus count. A smolt index code as specified in the Interagency Ecological Program Steelhead Project Work Team, Steelhead Life-stage Assessment Protocol was assessed for every measured salmon (marked and unmarked) and recorded. The smolt index criteria assigns a number from 1 to 5 for different stages of development: yolk sac fry; fry; parr; silvery parr; and smolt respectively.

During trap checks, 100 naturally produced juvenile chinook specimens were measured to the nearest mm fork length. The remainder were enumerated as plus counts but not measured. In order to estimate total daily catch of fry (<65 mm) and smolts (≥ 65 mm) the ratio of fry to smolts obtained from the measured specimens was applied to the plus counts. These estimated daily catches of fry and smolts were used in daily catch expansions. Daily expansions (the number of fry and smolts passing the trap per day) were determined by the equation

$$T_i = \frac{c_i}{u_i}$$

Equation 2.2

where T_i is the estimated number of fry or smolts passing the traps on day i ; c_i is the catch of fry or smolts for day i ; and u_i is the trap efficiency/vulnerability for fry or smolts for day i .

An annual estimate of juvenile salmon passing the traps was then made by summing the daily estimates for fry and smolts combined in each year. In other words, the annual production estimate is $\Sigma(T_{i(fry)} + T_{i(smolts)})$. Confidence intervals (95%) were calculated for the annual estimates of fry and smolt production using the following equations (Roper and Scarneccchia 2000).

$$C.I. = \hat{N}_j + Z_{\alpha/2} [Var(\hat{N}_j)]^{1/2}$$

Equation 2.3

$$Var(\hat{N}_j) = \hat{N}_j^2 (C_j - R_j) / [(C_j + 1)(R_j + 2)]$$

Equation 2.4

3. Results

3.1 Catch and Timing of Outmigration

The total catch of naturally produced chinook salmon in 1999 was 19,327, while in 2000 the total capture of naturally produced juveniles was 2,250. Figures 3.1 and 3.2 display the daily catches of natural chinook salmon juveniles for 1999 and 2000 respectively. In 1999 there is a large capture from late January through early February with another smaller peak in late April. A similar trend holds in 2000 except the peak in late January is missing and is much reduced in February (Figure 3.2). Peaks also occur from mid to late April and again mid-May. The total

catch of CWT's in 1999 was 184 and 241 in 2000. Daily CWT captures are displayed in Figures 3.3 and 3.4 respectively.

The fork length of naturally produced salmon is displayed in figures 3.5 and 3.6 for 1999 and 2000 respectively. These figures represent the fork lengths of fish caught but do not include the number of fish caught at each length. In other words, each point is a length that was recorded for that day but may contain any number of fish at that given length. These graphs are representative of the fish sizes passing the traps throughout the season.

3.2 Vulnerability Tests

In 1999 ten vulnerability tests were conducted (Table 3.1). Three of these were fry tests (fish < 65 mm FL). In 2000 seven tests were used in the vulnerability analysis. Four of these were fry tests (Table 3.1). Three tests were unusable in 2000 because of problems encountered with during the releases or during the recapture period. These tests are not recorded in table 3.1. Trap efficiency values were determined for both traps combined. Only one vulnerability release consisted of non-CWT fish in 1999. In 2000, four vulnerability releases consisted of non-CWT fish. The CWT codes used in the 1999 and 2000 vulnerability tests at Grayson were 06-45-33 and 06-45-08 respectively.

A linear regression conducted on the natural log transformed data for the fry tests against flow at Modesto yielded a line with an R-squared value of 0.86; n= 7 (Figure 3.7) indicating a linear relationship between fry and flow. The relationship between fry vulnerability and flow appears to be considerably better than the relationship between fry and the percent of flow sampled by the traps. The R-squared value for fry against the percent of flow is 0.37; n= 7 (Figure 3.8). Smolt efficiency did not exhibit as linear a relationship to flow or percent of flow as did the fry. Smolt vulnerability against flow exhibited an R-squared value of 0.0086; n= 10 (Figure 3.9). Smolt vulnerability against the percent of flow sampled by the traps yielded an R-squared value of 0.0011, n= 10 (Figure 3.10).

Daily expansions were made by back transforming the daily vulnerability/efficiency values. Figure 3.11a illustrates a rise in the daily fry estimate in 1999 corresponding to a rise in flow. Conversely, the daily estimate of fry against percent of flow indicates a peak immediately following a decline in the percent of flow sampled by the traps (Figure 3.11b). The greatest daily estimates of smolts passing the traps in 1999 exhibit a similar trend though less distinct (Figure

3.12a and b). In 2000 the estimate of fry passing the traps was greatest in late February and also corresponds to a rise in flow and a decrease in the percent of flow sampled (Figures 3.13a and b). Smolt estimates in 2000 are greatest when spikes in stream flow occurs (Figure 3.13a). The correlation to the percent of flow sampled is less clear (Figure 3.13b).

The total estimate of fry passing the traps in 1999 was 1,102,238 (Table 3.2) when the data was expanded using the flow measured at Modesto for the same day. The 1999 fry estimate drops to 1,042,805 when the expansions are based on the percent of flow sampled by the traps (Table 3.2). The total estimate of smolts passing the traps in 1999 was 31,650 based on flow and 30,864 based on the percent of flow (Table 3.2). In 2000 the annual fry production estimate was 90,064 based on flow (Table 3.2). When examining the data by percent of flow the annual fry production estimate was 84,314 in 2000. The estimate of smolts in 2000 was 48,960 based on flow and 47,703 based on the percent of flow (Table 3.2). The total estimate of juvenile production in 1999 was 1,133,887 using flow and 1,073,669 based on the percent of flow. In 2000 the total estimate of juvenile production was 139,024 for flow at Modesto and 132,017 based on the percent of flow sampled (Table 3.2).

4. Discussion

4.1. Catch and Timing

Catches of juvenile salmon appear to correlate to changes in river flow. Heyne and Loudermilk (1998) made a similar observation when the screw traps were located under the Shiloh Bridge approximately 1.5 miles downstream. Peaks in capture occur temporally with early peaks of fry occurring in January and February. Similar studies (Vick et al., 1998; Heyne and Loudermilk, 1999) in previous years indicate similar temporal peaks in outmigration. This data indicates that on the Tuolumne River, fry migrate down river in January and early to mid-February. Additionally, it appears that changes in flow, particularly flow increases, may initiate movement downstream. Differences in the number captured between years can be explained in part by the fact that throughout much of the fry migration period in 2000 the traps were positioned out of the thalweg. This was done because rainfall and high flows caused heavy debris loads at the traps. The traps remained out of the thalweg throughout most of the fry capture period. In 1999 the traps were positioned in the thalweg or nearly so during fry movement. Other factors may include an increase in trap downtime, variations in the horizontal distribution across the river channel, and natural variation in the population.

Smolt migration appears to occur mid-April through early May. Again the timing of this appears to be related to changes in stream flow, though this may not be as key an element as for fry. Smolts are more able to actively move down river than fry. Therefore the smaller peaks in captures may reflect 1) the majority of the population migrated as fry with early flows, 2) smolts are better able to avoid the traps and are under-represented in the capture, or 3) smolts migrate over a longer temporal scale and broader range of environmental variables. Therefore, the peaks in capture, generally associated with flow shifts are smaller than peaks associated with the capture of fry.

4.2. Vulnerability Tests and Estimates

There are inherent problems with using the rotary-screw traps to estimate trap efficiencies. Accurately estimating trap efficiencies requires numerous test releases, which can not be met over the time scale this study spans. Also, accurate efficiency estimates and expanded daily estimates assume the trap operated 100% of the sample period. This was not the case and it is often impossible to estimate the actual amount of time sampled. The inability to monitor the trap operation the entire time it is sampling resulted in periods of unknown 'downtime'. The most common problem was that revolution counters would break rendering it impossible to determine when the traps stopped during a sampling period. Even though some inaccuracy exists the estimates presented here assume the traps operated 100% of the sample period.

Although it is clear from the data that each trap has a different efficiency one value was used because the traps are operated in tandem. The true efficiency of each trap differs because of its position in the channel and orientation to the thalweg. However, since the two traps actually fish as a single unit it is acceptable to treat the vulnerability/efficiency as such. Additionally, the data indicates that the traps exhibit different vulnerability values when they are moved horizontally across the channel. Ideally, efficiency estimates would be made on each trap and for each trap location. This requires vulnerability tests for each trap position. However, in some cases tests were not conducted before the traps were moved. Hence, it is impossible to evaluate the vulnerability in all trap positions. Therefore, for the purposes of this report trap vulnerability/efficiency was pooled for all trap positions.

Trap efficiency is a key element in estimating juvenile production and the number of salmon passing the traps on a daily basis. Unfortunately, vulnerability is still little understood. Evaluations of trap efficiency require numerous tests under a wide range of variables. Although the rotary screw traps have been in operation on the Lower Tuolumne River since 1995 the last two years are the only years in which the trap location, operating time, and release protocol have been constant. Therefore, there is relatively little data with which to interpret results. Roper and Scarneccchia (2000) state that the use of a single fish trap can be an accurate means of estimating population size if the trap efficiency exceeds 10%. Trap efficiency in our studies never exceeded 4%. Furthermore, Roper and Scarneccchia (2000) suggest determining different efficiencies for hatchery and natural fish. This was accomplished in this study. For these reasons, the estimates of juveniles passing the trap should be interpreted cautiously and be considered preliminary until further work can be conducted.

As stated above the estimates of juvenile production should be treated cautiously. As should the confidence intervals placed on the estimates. The method used to create the confidence intervals was to pool vulnerability tests over both years. However, when determining the confidence intervals the captures and recaptures of only the year in question were used. This may reduce the confidence intervals artificially and inappropriately. A more appropriate method of determining confidence intervals may be to set confidence limits daily for each daily estimate. Unfortunately, this would require daily test releases and recaptures. Since daily tests were not conducted conventional confidence limits could not be utilized. The CDFG is currently in the process of attempting to determine the most appropriate method of establishing confidence limits on the data.

The data indicates a strong relation between trap efficiency and flow for the fry stage. The relationship for smolts is less clear. If a relationship between flow or the percent of flow and vulnerability is to be demonstrated for smolts, significantly more test releases would need to be conducted over a several different flows. To reduce the variability numerous releases should be conducted over a small time scale and at nearly similar flows. Although the data fit the linear regressions for flow better than linear regressions for percent of flow sampled, as indicated by higher R-squared values, the percent of flow should be examined further in the future. An increase in data points may show that the volume of water sampled could be a key element in accurately estimating fry and smolt production.

References

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Table 3.2. The number of fry and smolts captured each year, number released in vulnerability tests, the number recaptured, and population estimates for each year based on flow and the percent of flow sampled.

												Estimates Based on Flow			Estimates Based on % of Flow			
Year	Number Captured			Number Released			Number Recaptured			Fry	Smolts	Total	Fry	Smolts	Total	Fry	Smolts	Total
				Fry	Smolts	Total	Fry	Smolts	Total									
	Fry	Smolts	Total															
1999	18162	1165	19327	5953	14007	19960	178	265	443	1262468	34984	1238023	1194396	34117	1172274			
										1102238	31649	1133887	1042805	30864	1073669			
										942008	28314	1029751	891214	27611	975064			
2000	1493	757	2250	7367	5928	13295	167	87	254	102857	58523	155061	96290	57021	147246			
										90064	48960	139024	84314	47703	132017			
										77271	39397	122987	72338	38385	116788			

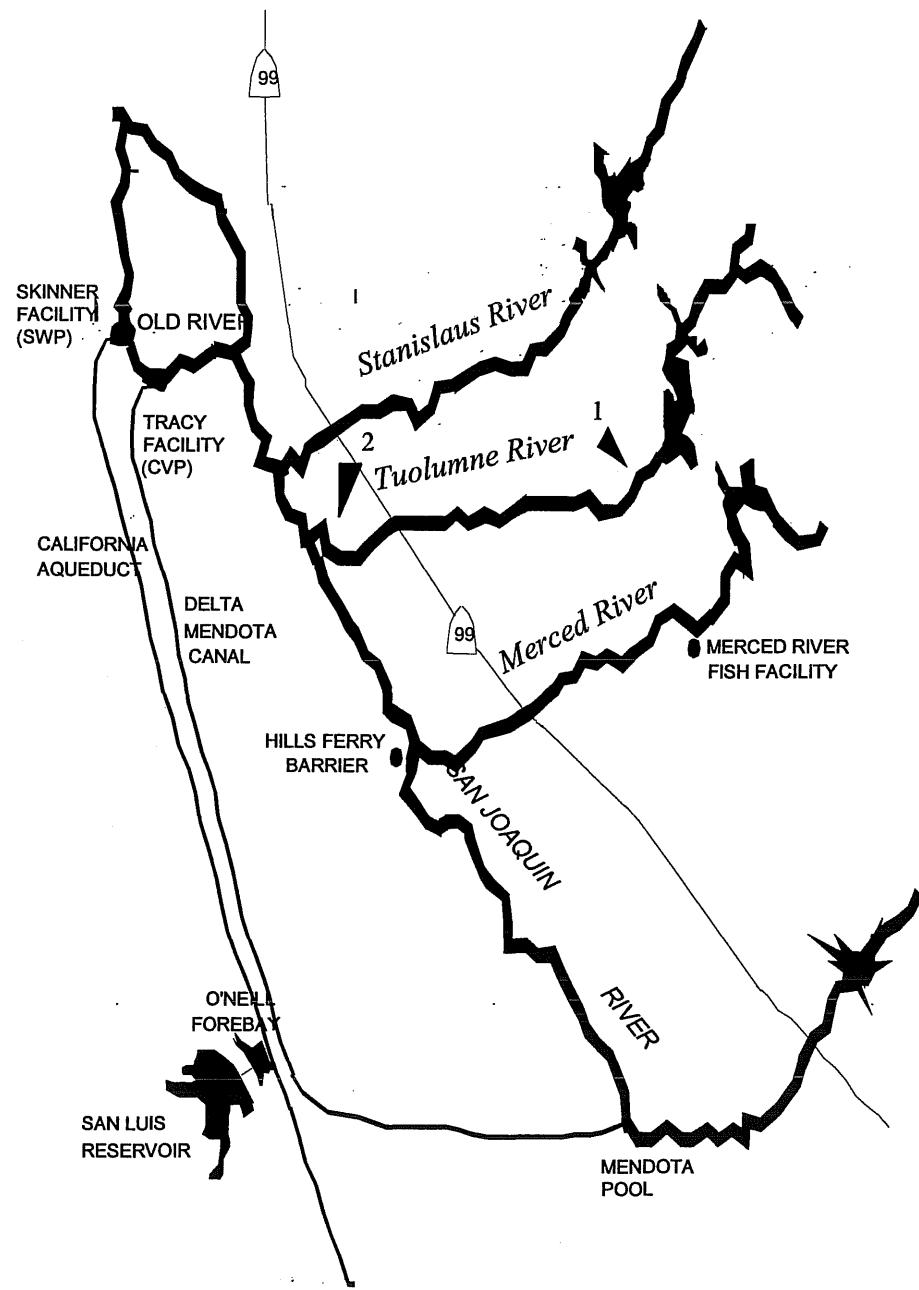


Figure 1.1. Map of San Joaquin River Basin with 1. La Grange and 2. Shiloh referenced for orientation purposes.

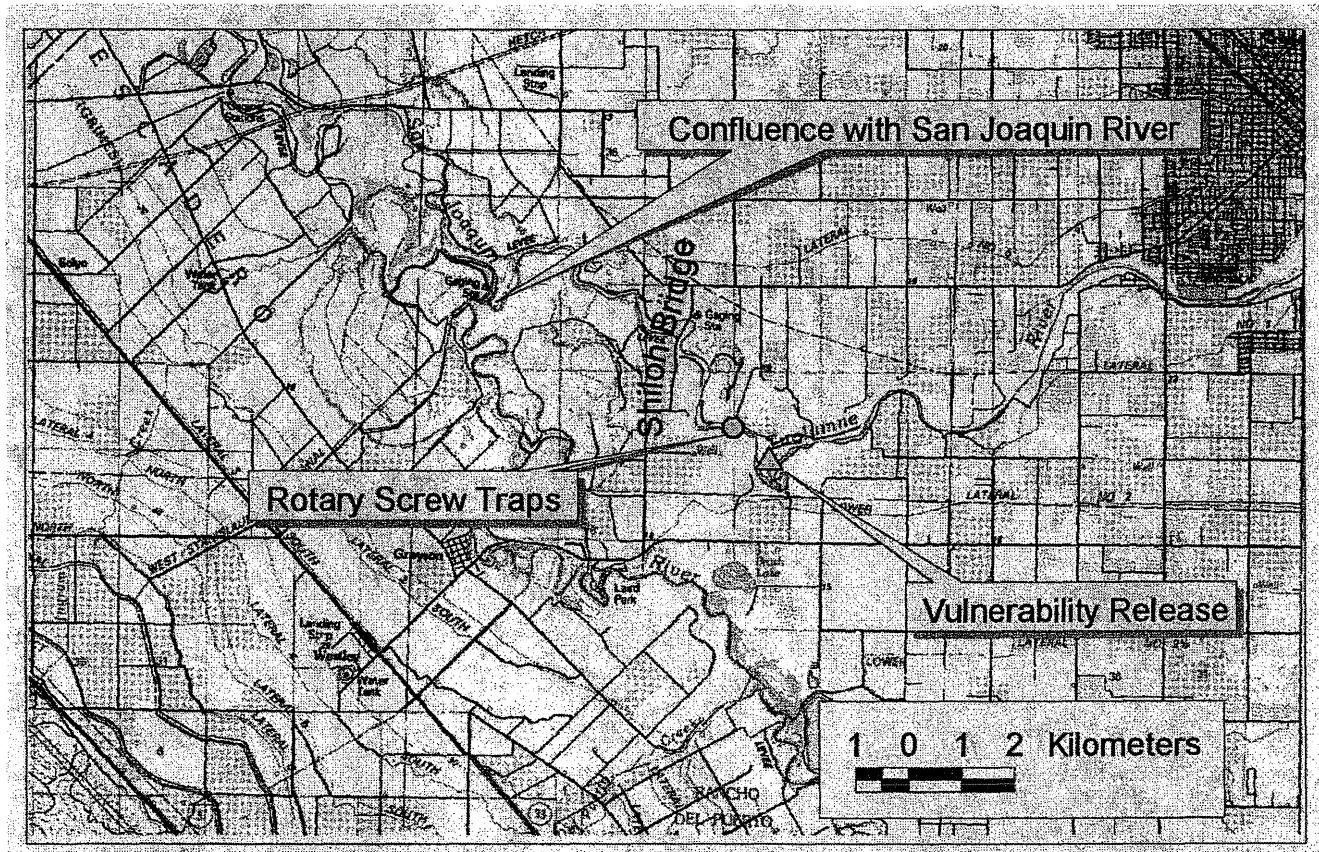


Figure 2.1. Lower section of the Tuolumne River indicating the location of the rotary-screw traps and vulnerability releases.

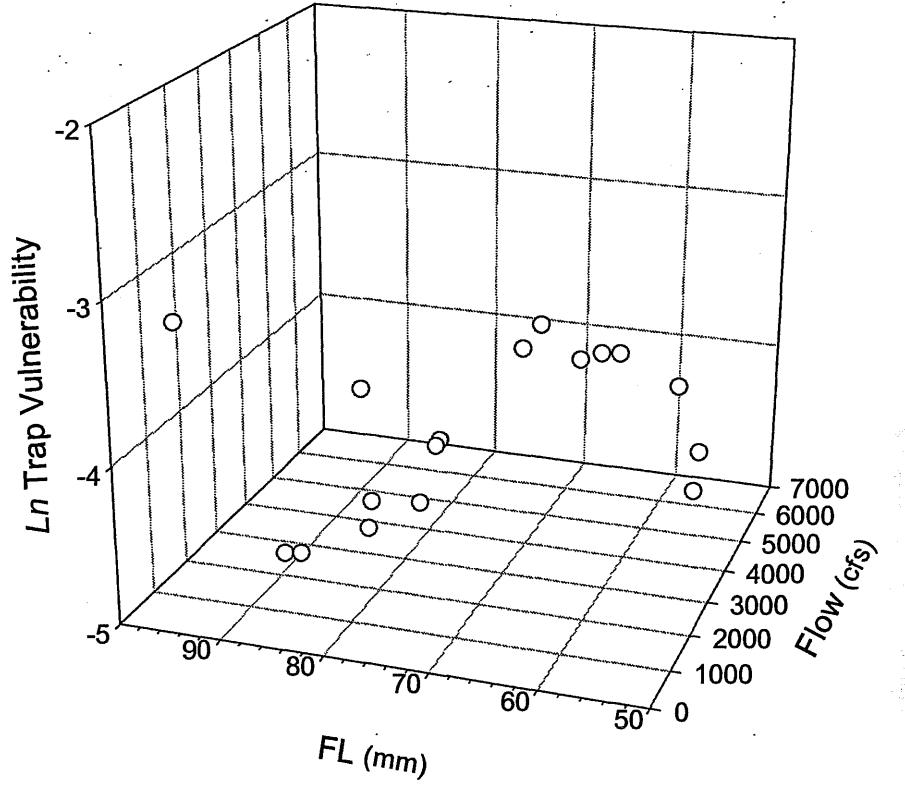


Figure 2.2. Trap vulnerability natural log transformed against flow and length. Notice the grouping suggests a division in efficiency values based on fish length.

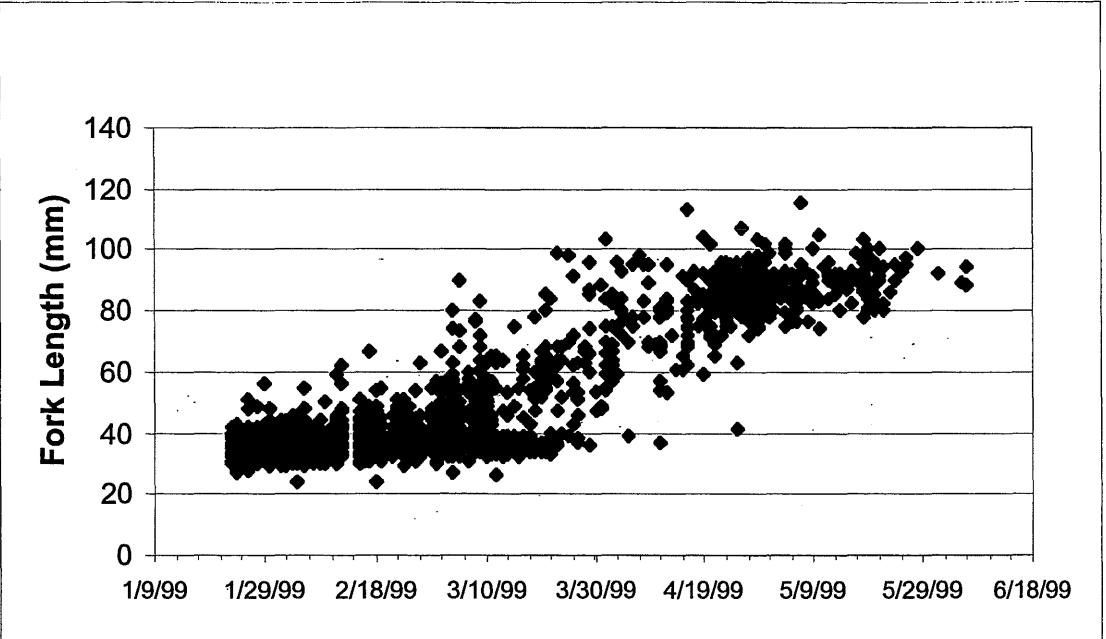


Figure 3.5.. Fork lengths of naturally produced salmon captured in 1999. Note the number of fish caught at each length is not represented in this figure.

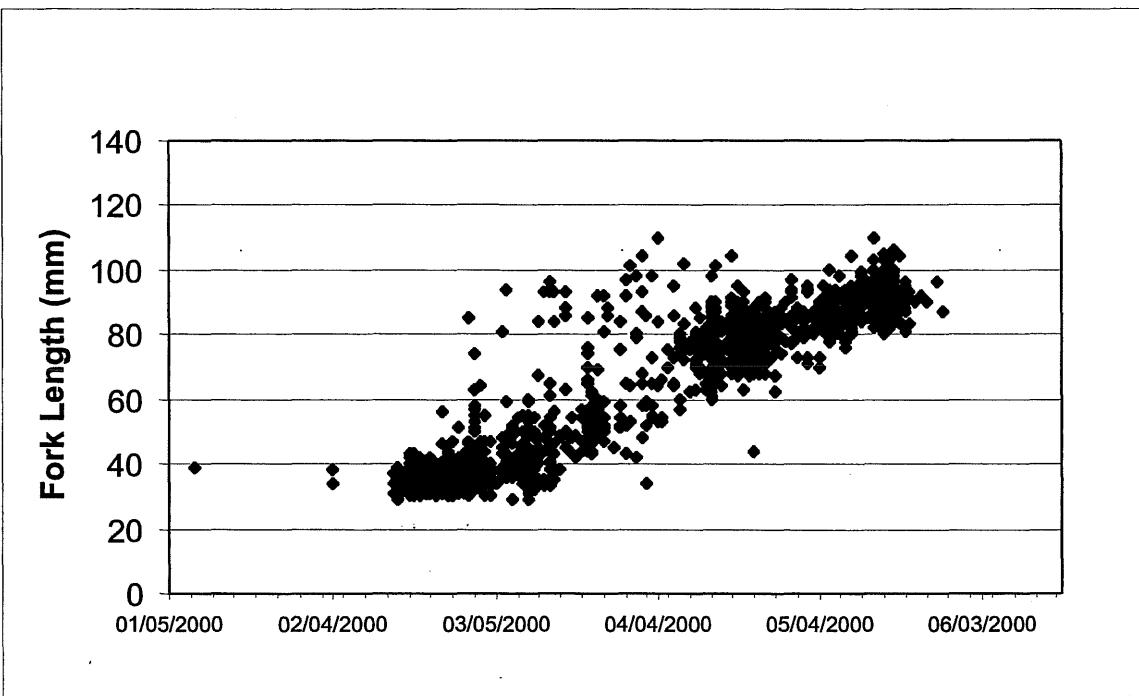


Figure 3.6. Fork lengths of naturally produced salmon captured in 2000. Note the number of fish caught at each length is not represented in this figure.

1999-2000 Fry Efficiency

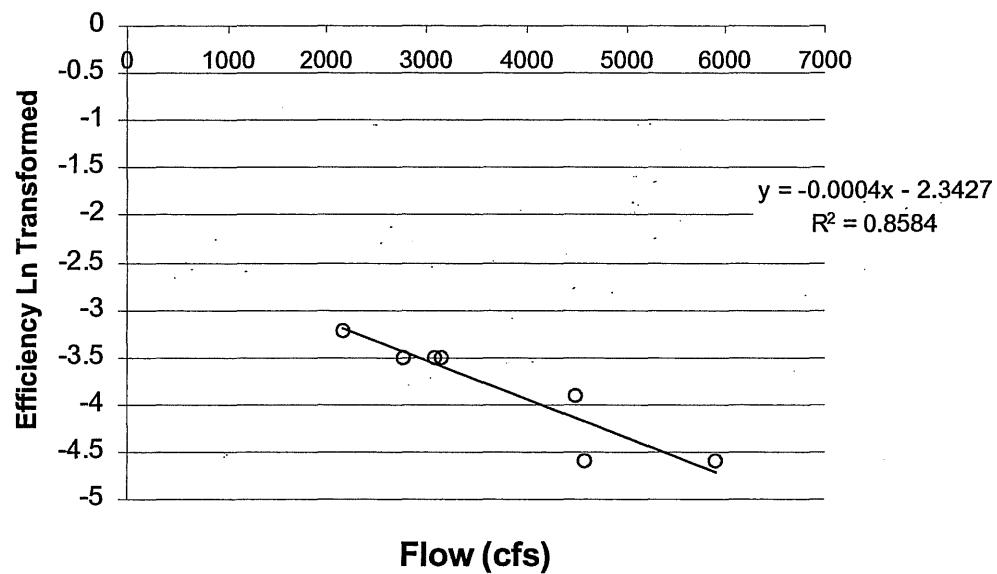


Figure 3.7. Vulnerability/trap efficiency for fry (FL < 65 mm) for 1999 and 2000 combined based on flow.

1999-2000 Fry Efficiency

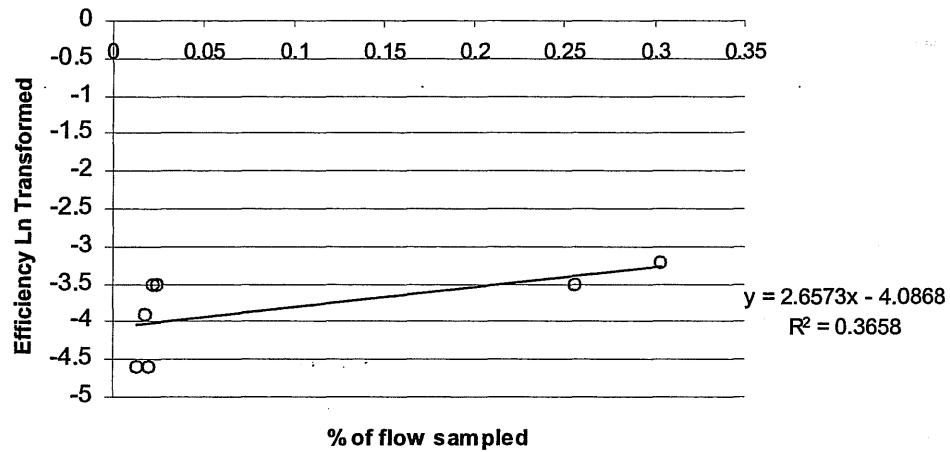


Figure 3.8. Vulnerability/trap efficiency for fry (FL < 65 mm) for 1999 and 2000 combined based on the percent of flow sampled by the traps.

1999-2000 Smolt Efficiency

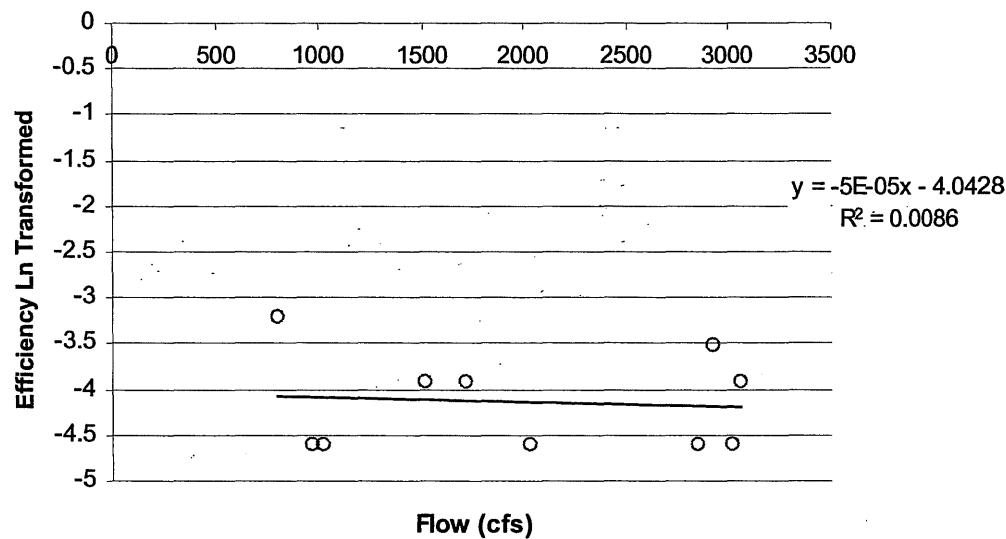


Figure 3.9. Vulnerability/trap efficiency for smolts ($FL \geq 65$ mm) for 1999 and 2000 combined based on flow.

1999-2000 Smolt Efficiency

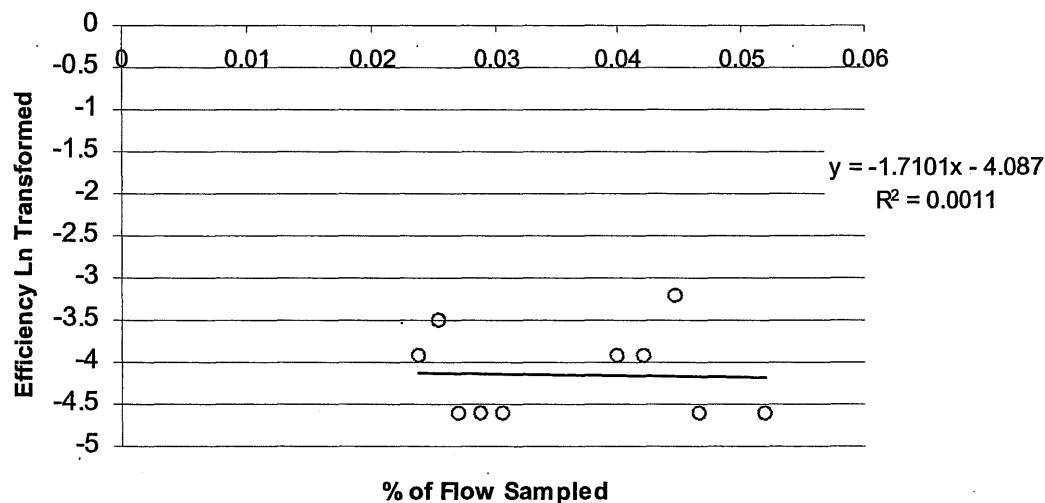


Figure 3.10. Vulnerability/trap efficiency for smolts ($FL \geq 65$ mm) for 1999 and 2000 combined based on percent of flow sampled by the traps.

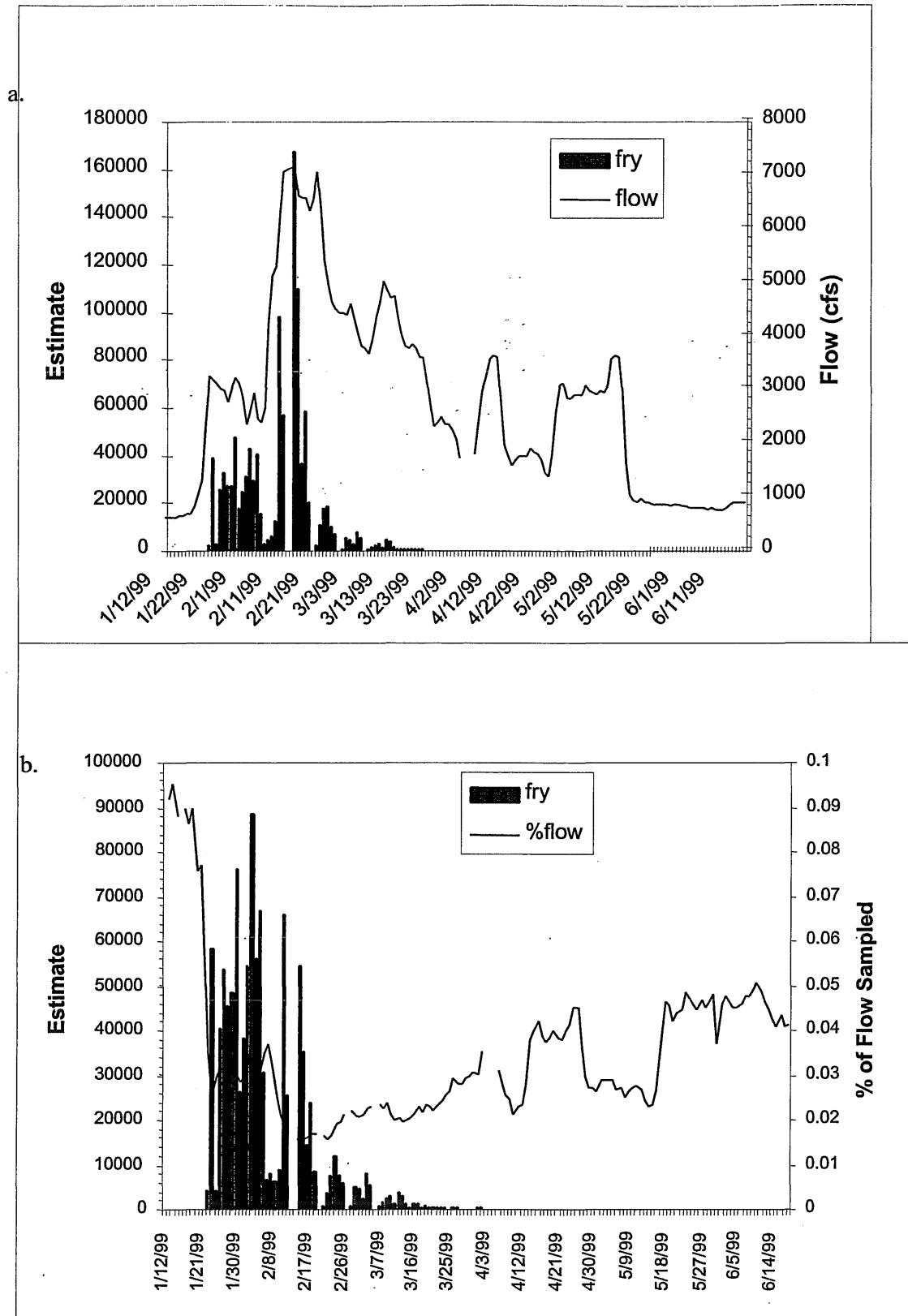


Figure 3.11. Expanded daily estimates of fry passing the traps in 1999 based on a. flow and b. percent of flow sampled.

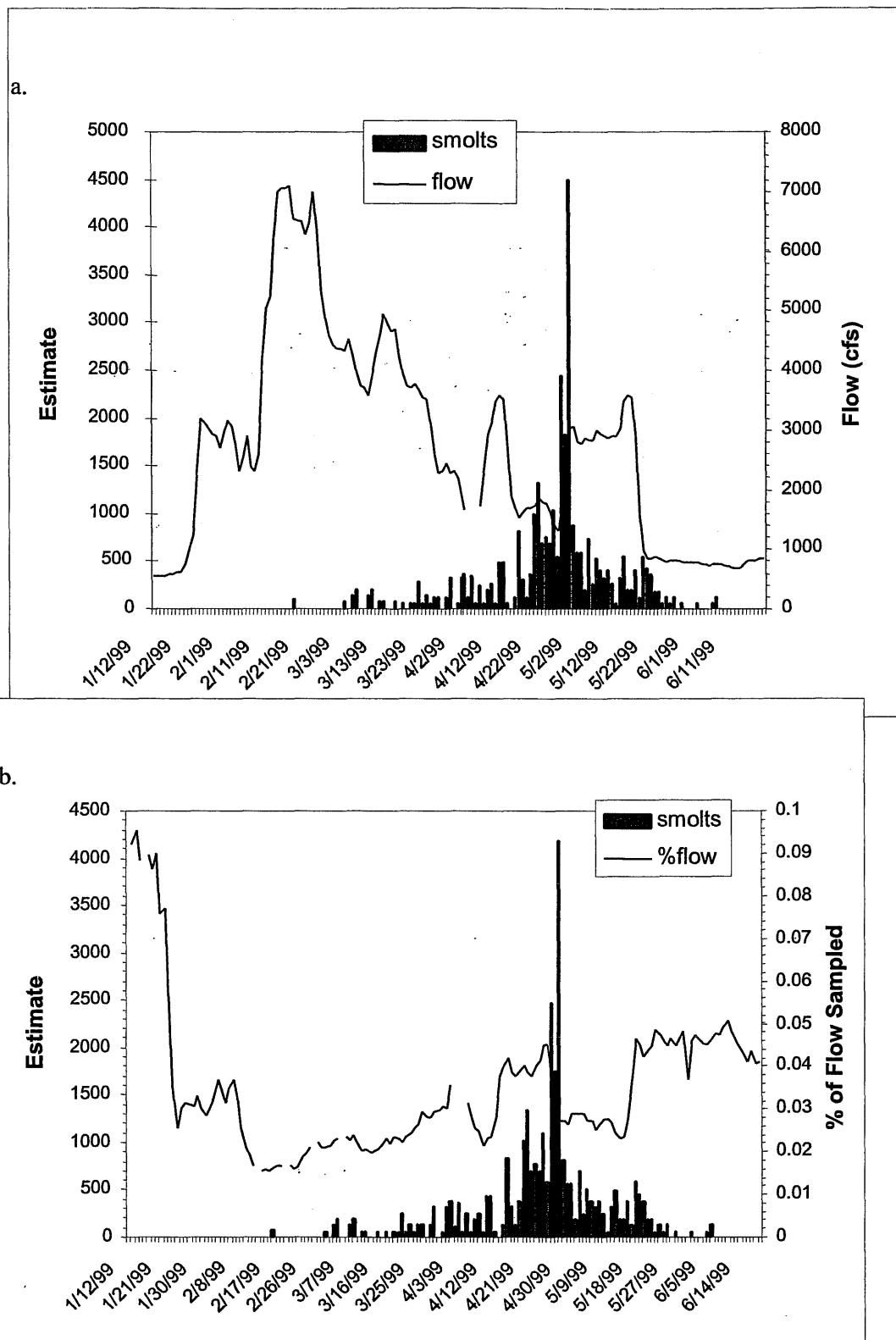


Figure 3.12. Expanded daily estimates of smolts passing the traps in 1999 based on a. flow and b. percent of flow sampled

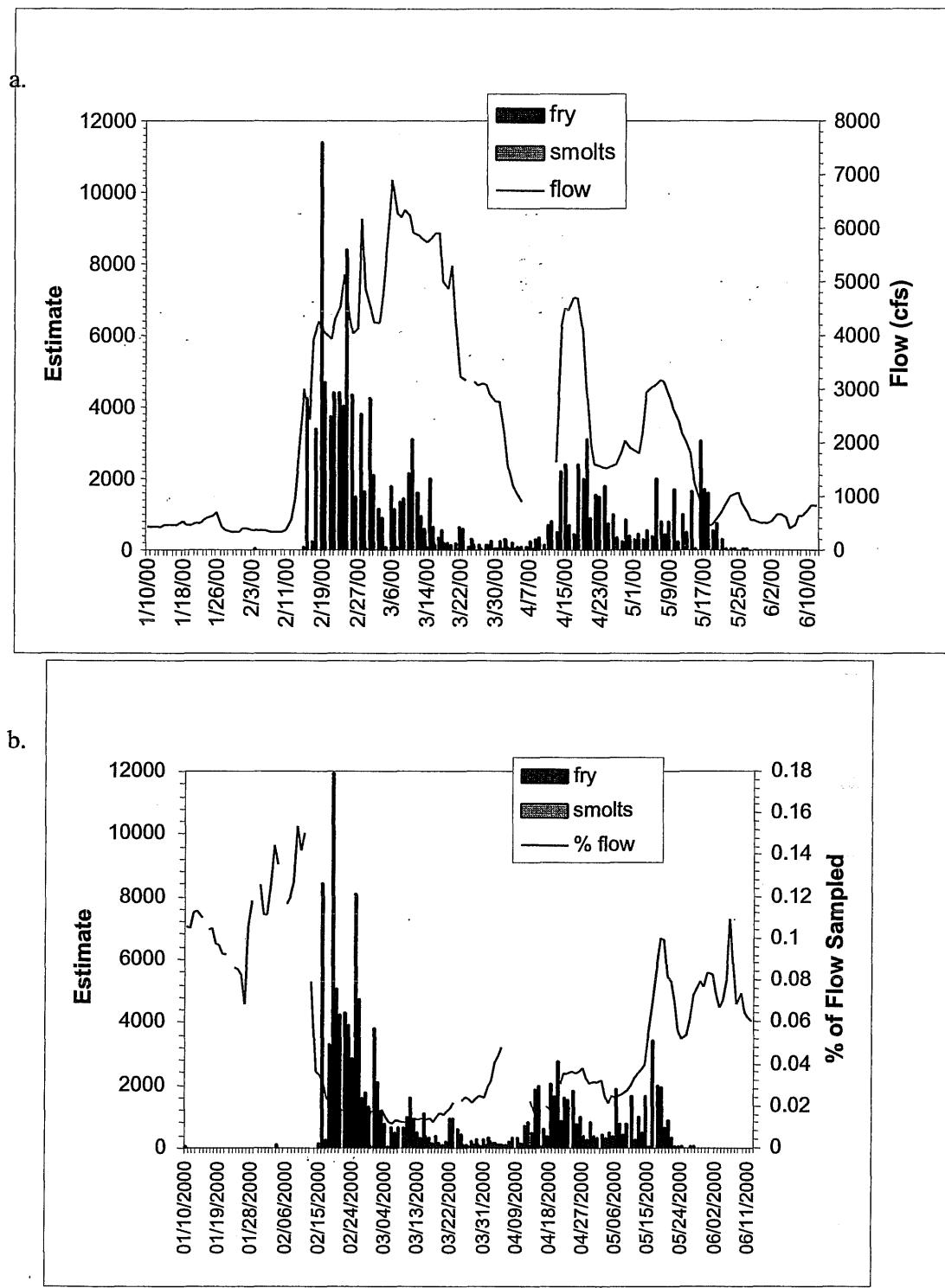


Figure 3.13. Expanded daily estimates of juvenile chinook salmon passing the traps in 2000 based on a. flow and b. percent of flow sampled.

**Appendix I. Tuolumne North Trap (TU005N) Status and Minutes Fished Per Sampling Period.
Tuolumne River RST Survey 1999.**

Sample Date	Sample Time	Trap Status	Minutes Sampled	Anomaly
12-Jan-99	15:00	Set	N/A	
13-Jan-99	8:24	Check	1044	
13-Jan-99	15:51	Check	447	
14-Jan-99	8:21	Check	990	
14-Jan-99	15:56	Check	455	
15-Jan-99	9:39	Pull	1063	
17-Jan-99	15:26	Set	N/A	
18-Jan-99	8:02	Check	996	
18-Jan-99	15:38	Check	456	
19-Jan-99	7:42	Check	964	
19-Jan-99	15:55	Check	493	
20-Jan-99	8:11	Check	976	
20-Jan-99	15:36	Check	445	
21-Jan-99	8:00	Check	984	
21-Jan-99	16:05	Check	485	
22-Jan-99	8:04	Check	959	
23-Jan-99	10:05	Check	1561	
24-Jan-99	10:00	Check	1435	
25-Jan-99	9:20	Pull	1400	
25-Jan-99	16:30	Set	N/A	
26-Jan-99	9:09	Check	999	
26-Jan-99	16:05	Check	416	
27-Jan-99	10:15	Check	1090	
27-Jan-99	15:55	Check	340	
28-Jan-99	9:30	Check	1055	
28-Jan-99	15:36	Check	366	
29-Jan-99	10:16	Check	1120	
29-Jan-99	17:34	Check	438	
30-Jan-99	11:02	Check	1048	
30-Jan-99	19:37	Check	515	
31-Jan-99	10:49	Check	912	
31-Jan-99	19:05	Check	496	
01-Feb-99	11:52	Check	1007	
01-Feb-99	19:51	Check	479	
02-Feb-99	8:47	Check	776	
02-Feb-99	19:23	Check	636	
03-Feb-99	9:20	Check	837	
03-Feb-99	20:26	Check	666	
04-Feb-99	9:05	Check	759	
04-Feb-99	18:41	Check	576	
05-Feb-99	9:06	Check	865	
05-Feb-99	19:45	Pull	639	

10-Feb-99	12:15	Set	N/A	
10-Feb-99	15:14	Check	179	
10-Feb-99	21:17	Check	363	
11-Feb-99	9:04	Check	707	
11-Feb-99	14:00	Check	296	
12-Feb-99	9:01	Pull	1141	
14-Feb-99	21:30	Set	N/A	
15-Feb-99	8:35	Check	665	
15-Feb-99	13:56	Check	321	
15-Feb-99	21:27	Check	451	
16-Feb-99	7:33	Check	606	
16-Feb-99	13:38	Check	365	
16-Feb-99	21:34	Check	476	
17-Feb-99	7:25	Check	591	
17-Feb-99	14:02	Check	397	
17-Feb-99	21:20	Check	438	
18-Feb-99	7:50	Check	630	
18-Feb-99	13:29	Check	339	
18-Feb-99	21:54	Check	505	
19-Feb-99	7:14	Pull	560	
23-Feb-99	13:45	Set	N/A	
23-Feb-99	21:22	Check	457	
24-Feb-99	7:53	Check	631	
24-Feb-99	13:16	Check	323	
24-Feb-99	21:40	Check	504	
25-Feb-99	7:58	Check	618	
25-Feb-99	13:14	Check	316	
25-Feb-99	21:44	Check	510	
26-Feb-99	6:50	Pull	546	
28-Feb-99	13:09	Set	3259	
28-Feb-99	21:53	Check	524	
01-Mar-99	7:22	Check	569	
01-Mar-99	13:21	Check	359	
01-Mar-99	21:18	Check	477	
02-Mar-99	6:57	Check	579	
02-Mar-99	13:35	Check	398	
02-Mar-99	21:18	Check	463	
03-Mar-99	7:14	Check	596	
03-Mar-99	13:47	Check	393	
03-Mar-99	21:06	Check	439	
04-Mar-99	7:19	Check	613	
04-Mar-99	13:22	Check	363	
04-Mar-99	21:41	Check	499	
05-Mar-99	7:13	Pull	572	
07-Mar-99	12:55	Set	N/A	
07-Mar-99	21:52	Check	537	
08-Mar-99	7:14	Check	562	

08-Mar-99	13:17	Check	363	
08-Mar-99	21:12	Check	475	
09-Mar-99	7:03	Check	591	
09-Mar-99	13:47	Check	404	
09-Mar-99	21:56	Check	489	
10-Mar-99	7:18	Check	562	
10-Mar-99	13:43	Check	385	
10-Mar-99	20:35	Check	412	
11-Mar-99	7:10	Check	635	
11-Mar-99	12:56	Check	346	
11-Mar-99	21:10	Check	494	
12-Mar-99	6:40	Check	570	
12-Mar-99	13:15	Check	395	
12-Mar-99	21:24	Check	489	
13-Mar-99	6:33	Check	549	
13-Mar-99	13:51	Check	438	
13-Mar-99	21:01	Check	430	
14-Mar-99	7:05	Check	604	
14-Mar-99	12:45	Check	340	
14-Mar-99	20:42	Check	477	
15-Mar-99	6:40	Check	598	
15-Mar-99	12:48	Check	368	
15-Mar-99	20:38	Check	470	
16-Mar-99	7:30	Check	652	
16-Mar-99	13:01	Check	331	
16-Mar-99	20:47	Check	466	
17-Mar-99	6:22	Check	575	
17-Mar-99	12:42	Check	380	
17-Mar-99	20:45	Check	483	
18-Mar-99	6:40	Check	595	
18-Mar-99	13:15	Check	395	
18-Mar-99	21:07	Check	472	
19-Mar-99	6:58	Check	591	
19-Mar-99	12:47	Check	349	
19-Mar-99	20:50	Check	483	
20-Mar-99	7:00	Check	610	
20-Mar-99	12:58	Check	358	
20-Mar-99	20:37	Check	459	
21-Mar-99	12:46	Check	969	
21-Mar-99	20:35	Check	469	
22-Mar-99	6:30	Check	595	
22-Mar-99	12:54	Check	384	
22-Mar-99	20:34	Check	460	
23-Mar-99	6:55	Check	621	
23-Mar-99	13:00	Check	365	
23-Mar-99	20:35	Check	455	
24-Mar-99	6:56	Check	621	

24-Mar-99	14:47	Check	471	
24-Mar-99	20:37	Check	350	
25-Mar-99	6:34	Check	597	
25-Mar-99	12:44	Check	370	
25-Mar-99	20:50	Check	486	
26-Mar-99	6:16	Check	566	
26-Mar-99	13:13	Check	417	
26-Mar-99	21:03	Check	470	
27-Mar-99	6:25	Check	562	
27-Mar-99	12:56	Check	391	
27-Mar-99	20:59	Check	483	
28-Mar-99	6:20	Check	561	
28-Mar-99	12:35	Check	375	
28-Mar-99	20:50	Check	495	
29-Mar-99	6:42	Check	592	
29-Mar-99	13:18	Check	396	
29-Mar-99	20:27	Check	429	
30-Mar-99	6:27	Check	600	
30-Mar-99	13:25	Check	418	
30-Mar-99	20:33	Check	428	
31-Mar-99	6:14	Check	581	
31-Mar-99	20:51	Check	877	
01-Apr-99	6:34	Check	583	
01-Apr-99	13:34	Check	420	
01-Apr-99	22:02	Check	508	
02-Apr-99	6:43	Check	521	
02-Apr-99	12:15	Check	332	
02-Apr-99	22:02	Check	587	
03-Apr-99	6:40	Check	518	
03-Apr-99	12:38	Check	358	
03-Apr-99	20:48	Check	490	
04-Apr-99	7:06	Check	618	
04-Apr-99	14:29	Check	443	
04-Apr-99	19:12	Check	283	
05-Apr-99	6:32	Check	680	
05-Apr-99	12:55	Check	383	
05-Apr-99	13:00	Check	5	
05-Apr-99	20:44	Check	464	
06-Apr-99	6:32	Check	588	
06-Apr-99	13:15	Check	403	
06-Apr-99	21:34	Check	499	
07-Apr-99	6:30	Check	536	
07-Apr-99	13:43	Check	433	
07-Apr-99	20:34	Check	411	
08-Apr-99	6:33	Check	599	
08-Apr-99	13:35	Check	422	
09-Apr-99	0:18	Check	643	

09-Apr-99	7:10	Check	412	
09-Apr-99	12:55	Check	345	
09-Apr-99	21:10	Check	495	
10-Apr-99	6:39	Check	569	
10-Apr-99	18:40	Check	721	
11-Apr-99	6:57	Check	737	
11-Apr-99	18:37	Check	700	
12-Apr-99	7:02	Check	745	
12-Apr-99	13:28	Pull	386	
12-Apr-99	21:00	Set	N/A	
13-Apr-99	6:50	Check	590	
13-Apr-99	13:20	Check	390	
13-Apr-99	21:48	Check	508	
14-Apr-99	6:36	Check	528	
14-Apr-99	14:13	Check	457	
14-Apr-99	20:45	Check	392	
15-Apr-99	6:40	Check	595	
15-Apr-99	13:30	Check	410	
16-Apr-99	0:48	Check	678	
16-Apr-99	6:33	Check	345	
16-Apr-99	12:40	Check	367	
16-Apr-99	21:01	Check	501	
17-Apr-99	7:20	Check	619	
17-Apr-99	13:00	Check	340	
17-Apr-99	21:06	Check	486	
18-Apr-99	7:00	Check	594	
18-Apr-99	13:00	Check	360	
18-Apr-99	21:00	Check	480	
19-Apr-99	7:22	Check	622	
19-Apr-99	15:30	Check	488	
19-Apr-99	20:40	Check	310	
20-Apr-99	6:42	Check	602	
20-Apr-99	13:57	Check	435	
21-Apr-99	1:04	Check	667	
21-Apr-99	6:35	Check	331	
21-Apr-99	13:22	Check	407	
21-Apr-99	20:39	Check	437	
22-Apr-99	7:14	Check	635	
22-Apr-99	13:18	Check	364	
22-Apr-99	21:05	Check	467	
23-Apr-99	7:00	Check	595	
23-Apr-99	13:17	Check	377	
23-Apr-99	21:20	Check	483	
24-Apr-99	7:15	Check	595	
24-Apr-99	13:20	Check	365	
24-Apr-99	20:32	Check	432	
25-Apr-99	6:35	Check	603	

25-Apr-99	13:05	Check	390	
25-Apr-99	20:45	Check	460	
26-Apr-99	6:39	Check	594	
26-Apr-99	13:58	Check	439	
26-Apr-99	20:25	Check	387	
27-Apr-99	6:35	Check	610	
27-Apr-99	12:53	Check	378	
27-Apr-99	20:36	Check	463	
28-Apr-99	7:08	Check	632	
28-Apr-99	12:27	Check	319	
28-Apr-99	20:43	Check	496	
29-Apr-99	7:25	Check	642	
29-Apr-99	14:51	Check	446	
29-Apr-99	20:13	Check	322	
30-Apr-99	6:36	Check	623	
30-Apr-99	13:33	Check	417	
01-May-99	0:13	Check	640	
01-May-99	7:21	Check	428	
01-May-99	18:51	Check	690	
02-May-99	6:28	Check	697	
02-May-99	12:55	Check	387	
02-May-99	18:39	Check	344	
03-May-99	6:57	Check	738	
03-May-99	14:08	Check	431	
03-May-99	20:28	Check	380	
04-May-99	6:30	Check	602	
04-May-99	20:30	Check	840	
05-May-99	6:24	Check	594	
05-May-99	13:08	Check	404	
05-May-99	22:43	Check	575	
06-May-99	6:50	Check	487	
06-May-99	12:55	Check	365	
06-May-99	20:45	Check	470	
07-May-99	6:34	Check	589	
07-May-99	13:45	Check	431	
07-May-99	21:39	Check	474	
08-May-99	6:00	Check	501	
08-May-99	12:55	Check	415	
08-May-99	20:45	Check	470	
09-May-99	6:32	Check	587	
09-May-99	12:55	Check	383	
10-May-99	7:33	Check	1118	
10-May-99	13:27	Check	354	
10-May-99	20:27	Check	420	
11-May-99	6:30	Check	603	
11-May-99	13:30	Check	420	
11-May-99	20:40	Check	430	

12-May-99	6:30	Check	590	
12-May-99	12:55	Check	385	
12-May-99	20:34	Check	459	
13-May-99	6:35	Check	601	
13-May-99	13:51	Check	436	
13-May-99	21:15	Check	444	
14-May-99	6:28	Check	553	
14-May-99	13:25	Check	417	
14-May-99	20:57	Check	452	
15-May-99	6:28	Check	571	
15-May-99	21:25	Check	897	
16-May-99	6:30	Check	545	
16-May-99	19:08	Check	758	
17-May-99	6:55	Check	707	
17-May-99	19:32	Check	757	
18-May-99	7:01	Check	689	
18-May-99	19:27	Check	746	
19-May-99	7:10	Check	703	
19-May-99	18:23	Check	673	
20-May-99	7:30	Check	787	
20-May-99	18:38	Check	668	
21-May-99	7:08	Check	750	
21-May-99	18:45	Check	697	
22-May-99	7:05	Check	740	
22-May-99	18:39	Check	694	
23-May-99	7:15	Check	756	
23-May-99	19:00	Check	705	
24-May-99	7:24	Check	744	
24-May-99	18:50	Check	686	
25-May-99	7:16	Check	746	
25-May-99	22:55	Check	939	
26-May-99	7:06	Check	491	
26-May-99	20:47	Check	821	
27-May-99	7:16	Check	629	
27-May-99	18:38	Check	682	
28-May-99	7:20	Check	762	
28-May-99	18:44	Check	684	
29-May-99	6:29	Check	705	
29-May-99	19:04	Check	755	
30-May-99	7:18	Check	734	
31-May-99	7:07	Check	1429	
01-Jun-99	6:30	Check	1403	
01-Jun-99	18:46	Check	736	
02-Jun-99	7:02	Check	736	
02-Jun-99	19:10	Check	728	
03-Jun-99	7:35	Check	745	
03-Jun-99	18:49	Check	674	

04-Jun-99	7:19	Check	750	
04-Jun-99	19:08	Check	709	
05-Jun-99	6:35	Check	687	
05-Jun-99	19:10	Check	755	
06-Jun-99	7:15	Check	725	
06-Jun-99	18:54	Check	699	
07-Jun-99	6:35	Check	701	
07-Jun-99	18:37	Check	722	
08-Jun-99	7:02	Check	745	
08-Jun-99	18:48	Check	706	
09-Jun-99	7:20	Check	752	
09-Jun-99	19:08	Check	708	
10-Jun-99	7:05	Check	717	
10-Jun-99	18:54	Check	709	
11-Jun-99	6:32	Check	698	
11-Jun-99	19:28	Check	776	
12-Jun-99	6:35	Check	667	
13-Jun-99	7:20	Check	1485	
13-Jun-99	18:24	Check	664	
14-Jun-99	7:05	Check	761	
14-Jun-99	18:08	Check	663	
15-Jun-99	6:45	Check	757	
15-Jun-99	19:06	Check	741	
16-Jun-99	7:05	Check	719	
16-Jun-99	18:56	Check	711	
17-Jun-99	7:03	Check	727	
17-Jun-99	18:34	Check	691	
18-Jun-99	6:40	Pull	726	

**Appendix I. Tuolumne South Trap (TU005S) Status and Minutes Fished Per Sampling Period.
Tuolumne River RST Survey 1999.**

Sample Date	Sample Time	Trap Status	Minutes Sampled	Anomaly
12-Jan-99	15:00	Set	N/A	Set without Pull
13-Jan-99	8:14	Check	1034	
13-Jan-99	15:53	Check	459	
14-Jan-99	8:05	Check	972	
14-Jan-99	15:58	Check	473	
15-Jan-99	9:03	Pull	1025	
17-Jan-99	15:22	Set	N/A	
18-Jan-99	7:36	Check	974	
18-Jan-99	15:42	Check	486	
19-Jan-99	7:28	Check	946	
19-Jan-99	15:43	Check	495	
20-Jan-99	7:28	Check	945	
20-Jan-99	15:39	Check	491	
21-Jan-99	7:26	Check	947	
21-Jan-99	15:37	Check	491	
22-Jan-99	7:05	Check	928	
23-Jan-99	8:55	Check	1550	
24-Jan-99	11:45	Check	1610	
25-Jan-99	8:04	Pull	1219	
25-Jan-99	16:30	Set	N/A	
26-Jan-99	8:13	Check	943	
26-Jan-99	15:48	Check	455	
27-Jan-99	8:16	Check	988	
27-Jan-99	16:10	Check	474	
28-Jan-99	8:11	Check	961	
28-Jan-99	15:50	Check	459	
29-Jan-99	8:01	Check	971	
29-Jan-99	17:46	Check	585	
30-Jan-99	9:27	Check	941	
30-Jan-99	20:37	Check	670	
31-Jan-99	8:46	Check	729	
31-Jan-99	19:59	Check	673	
01-Feb-99	8:52	Check	773	
01-Feb-99	19:11	Check	619	
02-Feb-99	7:34	Check	743	
02-Feb-99	19:45	Check	731	
03-Feb-99	7:25	Check	700	
03-Feb-99	19:19	Check	714	
04-Feb-99	7:48	Check	749	
04-Feb-99	19:11	Check	683	
05-Feb-99	7:30	Check	739	
05-Feb-99	20:10	Check	760	

06-Feb-99	7:30	Check	680	
06-Feb-99	19:03	Check	693	
07-Feb-99	7:40	Check	757	
07-Feb-99	19:26	Check	706	
08-Feb-99	7:22	Check	716	
08-Feb-99	16:52	Check	570	
09-Feb-99	7:35	Check	883	
09-Feb-99	18:51	Check	676	
10-Feb-99	8:06	Pull	795	
10-Feb-99	12:15	Set	N/A	
10-Feb-99	14:25	Check	130	
10-Feb-99	22:10	Check	465	
11-Feb-99	7:45	Check	575	
11-Feb-99	14:14	Check	389	
12-Feb-99	7:44	Pull	1050	
14-Feb-99	21:21	Set	N/A	
15-Feb-99	7:25	Check	604	
15-Feb-99	13:22	Check	357	
15-Feb-99	22:06	Check	524	
16-Feb-99	6:47	Check	521	
16-Feb-99	13:47	Check	420	
16-Feb-99	22:11	Check	504	
17-Feb-99	7:02	Check	531	
17-Feb-99	13:42	Check	400	
17-Feb-99	21:30	Check	468	
18-Feb-99	7:07	Check	577	
18-Feb-99	13:41	Check	394	
18-Feb-99	22:30	Check	529	
19-Feb-99	7:50	Pull	560	
21-Feb-99	12:58	Set	N/A	
21-Feb-99	21:37	Check	519	
22-Feb-99	7:00	Check	563	
22-Feb-99	13:18	Check	378	
22-Feb-99	21:24	Check	486	
23-Feb-99	7:15	Check	591	
23-Feb-99	13:27	Check	372	
23-Feb-99	21:52	Check	505	
24-Feb-99	7:12	Check	560	
24-Feb-99	16:33	Check	561	
24-Feb-99	21:50	Check	317	
25-Feb-99	7:31	Check	581	
25-Feb-99	13:20	Check	349	
25-Feb-99	22:04	Check	524	
26-Feb-99	6:45	Pull	521	
28-Feb-99	13:10	Set	N/A	
28-Feb-99	22:14	Check	544	
01-Mar-99	6:58	Check	524	

01-Mar-99	13:06	Check	368	
01-Mar-99	21:27	Check	501	
02-Mar-99	6:36	Check	549	
02-Mar-99	13:29	Check	413	
02-Mar-99	21:45	Check	496	
03-Mar-99	6:54	Check	549	
03-Mar-99	14:00	Check	426	
03-Mar-99	21:24	Check	444	
04-Mar-99	6:55	Check	571	
04-Mar-99	13:44	Check	409	
04-Mar-99	22:03	Check	499	
05-Mar-99	6:45	Pull	522	
07-Mar-99	12:56	Set	N/A	
07-Mar-99	22:12	Check	556	
08-Mar-99	6:42	Check	510	
08-Mar-99	13:10	Check	388	
08-Mar-99	21:32	Check	502	
09-Mar-99	7:17	Check	585	
09-Mar-99	14:15	Check	418	
09-Mar-99	22:13	Check	478	
10-Mar-99	6:54	Check	521	
10-Mar-99	13:24	Check	390	
10-Mar-99	20:45	Check	441	
11-Mar-99	6:25	Check	580	
11-Mar-99	13:08	Check	403	
11-Mar-99	21:37	Check	509	
12-Mar-99	6:25	Check	528	
12-Mar-99	12:59	Check	394	
12-Mar-99	21:10	Check	491	
13-Mar-99	6:17	Check	547	
13-Mar-99	12:42	Check	385	
13-Mar-99	20:47	Check	485	
14-Mar-99	6:51	Check	604	
14-Mar-99	12:30	Check	339	
14-Mar-99	20:58	Check	508	
15-Mar-99	6:25	Check	567	
15-Mar-99	12:46	Check	381	
15-Mar-99	20:51	Check	485	
16-Mar-99	7:18	Check	627	
16-Mar-99	13:12	Check	354	
16-Mar-99	21:01	Check	469	
17-Mar-99	6:05	Check	544	
17-Mar-99	12:35	Check	390	
17-Mar-99	20:56	Check	501	
18-Mar-99	6:20	Check	564	
18-Mar-99	13:10	Check	410	
18-Mar-99	21:14	Check	484	

19-Mar-99	7:11	Check	597	
19-Mar-99	12:43	Check	332	
19-Mar-99	21:00	Check	497	
20-Mar-99	6:40	Check	580	
20-Mar-99	12:53	Check	373	
20-Mar-99	20:50	Check	477	
21-Mar-99	12:32	Check	942	
21-Mar-99	20:52	Check	500	
22-Mar-99	6:20	Check	568	
22-Mar-99	12:43	Check	383	
22-Mar-99	20:44	Check	481	
23-Mar-99	6:30	Check	586	
23-Mar-99	13:18	Check	408	
23-Mar-99	20:44	Check	446	
24-Mar-99	6:45	Check	601	
24-Mar-99	14:40	Check	475	
24-Mar-99	21:00	Check	380	
25-Mar-99	6:15	Check	555	
25-Mar-99	12:56	Check	401	
25-Mar-99	21:00	Check	484	
26-Mar-99	6:02	Check	542	
26-Mar-99	13:05	Check	423	
26-Mar-99	21:19	Check	494	
27-Mar-99	6:10	Check	531	
27-Mar-99	12:47	Check	397	
27-Mar-99	20:40	Check	473	
28-Mar-99	6:30	Check	590	
28-Mar-99	12:45	Check	375	
28-Mar-99	21:08	Check	503	
29-Mar-99	6:31	Check	563	
29-Mar-99	13:15	Check	404	
29-Mar-99	20:35	Check	440	
30-Mar-99	6:22	Check	587	
30-Mar-99	13:15	Check	413	
30-Mar-99	20:38	Check	443	
31-Mar-99	6:03	Check	565	
31-Mar-99	20:56	Check	893	
01-Apr-99	6:18	Check	562	
01-Apr-99	13:37	Check	439	
01-Apr-99	22:30	Check	533	
02-Apr-99	6:16	Check	466	
02-Apr-99	13:00	Check	404	
02-Apr-99	20:50	Check	470	
03-Apr-99	6:31	Check	581	
03-Apr-99	12:25	Check	354	
03-Apr-99	21:02	Check	517	
04-Apr-99	6:52	Check	590	

04-Apr-99	19:22	Check	750	
05-Apr-99	6:25	Check	663	
05-Apr-99	12:55	Check	390	
05-Apr-99	20:54	Check	479	
06-Apr-99	6:17	Check	563	
06-Apr-99	13:00	Check	403	
06-Apr-99	21:17	Check	497	
07-Apr-99	6:12	Check	535	
07-Apr-99	13:37	Check	445	
07-Apr-99	20:54	Check	437	
08-Apr-99	6:20	Check	566	
08-Apr-99	13:12	Check	412	
08-Apr-99	23:40	Check	628	
09-Apr-99	6:50	Check	430	
09-Apr-99	12:35	Check	345	
09-Apr-99	21:20	Check	525	
10-Apr-99	7:25	Check	605	
10-Apr-99	18:50	Check	685	
11-Apr-99	6:38	Check	708	
11-Apr-99	18:47	Check	729	
12-Apr-99	6:38	Check	711	
12-Apr-99	13:16	Check	398	
12-Apr-99	20:30	Check	434	
13-Apr-99	6:35	Check	605	
13-Apr-99	13:32	Check	417	
13-Apr-99	21:07	Check	455	
14-Apr-99	6:18	Check	551	
14-Apr-99	13:43	Check	445	
14-Apr-99	21:06	Check	443	
15-Apr-99	6:23	Check	557	
15-Apr-99	13:00	Check	397	
16-Apr-99	1:14	Check	734	
16-Apr-99	6:21	Check	307	
16-Apr-99	12:30	Check	369	
16-Apr-99	20:47	Check	497	
17-Apr-99	7:00	Check	613	
17-Apr-99	13:03	Check	363	
17-Apr-99	21:19	Check	496	
18-Apr-99	6:45	Check	566	
18-Apr-99	12:50	Check	365	
18-Apr-99	21:13	Check	503	
19-Apr-99	6:50	Check	577	
19-Apr-99	16:37	Check	587	
19-Apr-99	20:55	Check	258	
20-Apr-99	7:08	Check	613	
20-Apr-99	14:10	Check	422	
21-Apr-99	1:22	Check	672	

21-Apr-99	6:15	Check	293	
21-Apr-99	12:56	Check	401	
21-Apr-99	21:02	Check	486	
22-Apr-99	6:45	Check	583	
22-Apr-99	12:55	Check	370	
22-Apr-99	21:30	Check	515	
23-Apr-99	7:48	Check	618	
23-Apr-99	13:27	Check	339	
23-Apr-99	21:05	Check	458	
24-Apr-99	7:00	Check	595	
24-Apr-99	13:10	Check	370	
24-Apr-99	20:45	Check	455	
25-Apr-99	6:19	Check	574	
25-Apr-99	12:45	Check	386	
25-Apr-99	20:56	Check	491	
26-Apr-99	7:02	Check	606	
26-Apr-99	14:14	Check	432	
26-Apr-99	20:28	Check	374	
27-Apr-99	6:10	Check	582	
27-Apr-99	13:02	Check	412	
27-Apr-99	20:46	Check	464	
28-Apr-99	6:43	Check	597	
28-Apr-99	12:11	Check	328	
28-Apr-99	20:58	Check	527	
29-Apr-99	6:43	Check	585	
29-Apr-99	14:58	Check	495	
29-Apr-99	20:33	Check	335	
30-Apr-99	6:15	Check	582	
30-Apr-99	13:43	Check	448	
01-May-99	0:04	Check	621	
01-May-99	7:07	Check	423	
01-May-99	19:01	Check	714	
02-May-99	6:13	Check	672	
02-May-99	12:48	Check	395	
02-May-99	18:45	Check	357	
03-May-99	6:27	Check	702	
03-May-99	13:56	Check	449	
03-May-99	20:35	Check	399	
04-May-99	6:20	Check	585	
04-May-99	14:43	Check	503	
04-May-99	20:36	Check	353	
05-May-99	6:10	Check	574	
05-May-99	13:27	Check	437	
05-May-99	23:01	Check	574	
06-May-99	6:22	Check	441	
06-May-99	13:04	Check	402	
06-May-99	20:57	Check	473	

07-May-99	6:51	Check	594	
07-May-99	13:58	Check	427	
07-May-99	21:49	Check	471	
08-May-99	5:45	Check	476	
08-May-99	13:12	Check	447	
08-May-99	20:55	Check	463	
09-May-99	6:20	Check	565	
09-May-99	12:45	Check	385	
10-May-99	6:59	Check	1094	
10-May-99	13:22	Check	383	
10-May-99	20:35	Check	433	
11-May-99	6:15	Check	580	
11-May-99	13:38	Check	443	
11-May-99	20:50	Check	432	
12-May-99	6:20	Check	570	
12-May-99	12:59	Check	399	
12-May-99	20:42	Check	463	
13-May-99	6:25	Check	583	
13-May-99	13:33	Check	428	
13-May-99	21:37	Check	484	
14-May-99	6:15	Check	518	
14-May-99	13:34	Check	439	
14-May-99	21:11	Check	457	
15-May-99	6:36	Check	565	
15-May-99	21:54	Check	918	
16-May-99	6:15	Check	501	
16-May-99	19:22	Check	787	
17-May-99	6:40	Check	678	
17-May-99	19:40	Check	780	
18-May-99	6:45	Check	665	
18-May-99	19:07	Check	742	
19-May-99	6:50	Check	703	
19-May-99	18:30	Check	700	
20-May-99	7:07	Check	757	
20-May-99	18:46	Check	699	
21-May-99	7:16	Check	750	
21-May-99	19:00	Check	704	
22-May-99	6:43	Check	703	
22-May-99	18:44	Check	721	
23-May-99	6:51	Check	727	
23-May-99	19:07	Check	736	
24-May-99	7:00	Check	713	
24-May-99	18:55	Check	715	
25-May-99	7:25	Check	750	
25-May-99	23:14	Check	949	
26-May-99	6:55	Check	461	
26-May-99	20:51	Check	836	

27-May-99	6:51	Check	600	
27-May-99	18:48	Check	717	
28-May-99	6:45	Check	717	
28-May-99	18:57	Check	732	
29-May-99	6:39	Check	702	
29-May-99	19:17	Check	758	
30-May-99	6:58	Check	701	
31-May-99	7:26	Check	1468	
01-Jun-99	6:45	Check	1399	
01-Jun-99	18:59	Check	734	
02-Jun-99	6:55	Check	716	
02-Jun-99	19:21	Check	746	
03-Jun-99	7:20	Check	719	
03-Jun-99	18:52	Check	692	
04-Jun-99	7:03	Check	731	
04-Jun-99	19:09	Check	726	
05-Jun-99	6:50	Check	701	
05-Jun-99	19:28	Check	758	
06-Jun-99	7:04	Check	696	
06-Jun-99	19:17	Check	733	
07-Jun-99	7:03	Check	706	
07-Jun-99	18:43	Check	700	
08-Jun-99	6:50	Check	727	
08-Jun-99	19:03	Check	733	
09-Jun-99	6:50	Check	707	
09-Jun-99	19:20	Check	750	
10-Jun-99	6:50	Check	690	
10-Jun-99	18:59	Check	729	
11-Jun-99	6:46	Check	707	
11-Jun-99	19:45	Check	779	
12-Jun-99	6:55	Check	670	
13-Jun-99	7:05	Check	1450	
13-Jun-99	18:33	Check	688	
14-Jun-99	7:32	Check	779	
14-Jun-99	18:16	Check	644	
15-Jun-99	7:05	Check	769	
15-Jun-99	19:23	Check	738	
16-Jun-99	6:50	Check	687	
16-Jun-99	19:04	Check	734	
17-Jun-99	6:55	Check	711	
17-Jun-99	18:46	Check	711	
18-Jun-99	7:05	Check	739	

**Appendix I. Tuolumne North Trap (TU005N) Daily Status and Minutes Per Sampling Period.
Tuolumne River RST Survey 2000.**

Sample Date	Sample Time	Trap Status	Minutes Sampled	Anomaly
09-Jan-00	19:31	Set	N/A	
10-Jan-00	8:24	Check	773	
10-Jan-00	19:09	Check	645	
11-Jan-00	7:35	Check	746	
11-Jan-00	18:48	Check	673	
12-Jan-00	7:35	Check	767	
12-Jan-00	19:03	Check	688	
13-Jan-00	7:29	Check	746	
13-Jan-00	18:42	Check	673	
14-Jan-00	8:05	Check	803	
14-Jan-00	18:40	Pull	635	
16-Jan-00	18:54	Set	N/A	
17-Jan-00	7:40	Check	766	
17-Jan-00	19:12	Check	692	
18-Jan-00	7:30	Check	738	
18-Jan-00	21:15	Check	825	
19-Jan-00	8:26	Check	671	
19-Jan-00	19:28	Check	662	
20-Jan-00	7:40	Check	732	
20-Jan-00	19:38	Check	718	
21-Jan-00	7:55	Check	737	
21-Jan-00	19:40	Pull	705	
23-Jan-00	19:07	Set	N/A	
24-Jan-00	8:46	Check	819	
24-Jan-00	19:58	Check	672	
25-Jan-00	9:00	Check	782	
25-Jan-00	21:40	Check	760	
26-Jan-00	8:37	Check	657	
26-Jan-00	20:40	Check	723	
27-Jan-00	8:15	Check	695	
27-Jan-00	20:18	Check	723	
28-Jan-00	7:40	Check	682	
28-Jan-00	20:22	Pull	762	
30-Jan-00	18:51	Set	N/A	
31-Jan-00	7:55	Check	784	
31-Jan-00	20:18	Check	743	
01-Feb-00	7:04	Check	646	
01-Feb-00	19:00	Check	716	
02-Feb-00	8:19	Check	799	
02-Feb-00	19:05	Check	646	
03-Feb-00	7:00	Check	715	
03-Feb-00	19:42	Check	762	

04-Feb-00	7:27	Check	705	
04-Feb-00	18:06	Pull	639	
06-Feb-00	18:37	Set	N/A	
07-Feb-00	7:18	Check	761	
07-Feb-00	19:10	Check	712	
08-Feb-00	7:12	Check	722	
08-Feb-00	18:15	Check	663	
09-Feb-00	7:17	Check	782	
09-Feb-00	19:20	Check	723	
10-Feb-00	7:26	Check	726	
10-Feb-00	18:55	Check	689	
11-Feb-00	7:57	Check	782	
11-Feb-00	19:26	Pull	689	
13-Feb-00	19:03	Set	2857	
14-Feb-00	8:00	Check	777	
14-Feb-00	10:30	Pull	150	
14-Feb-00	19:45	Pull	N/A	Pull without Set or Check
15-Feb-00	7:45	Pull	N/A	Pull without Set or Check
15-Feb-00	18:00	Set	615	
15-Feb-00	21:50	Check	230	
16-Feb-00	7:53	Check	603	
16-Feb-00	20:18	Check	745	
17-Feb-00	9:50	Check	812	
17-Feb-00	22:15	Check	745	
18-Feb-00	7:24	Check	549	
18-Feb-00	19:49	Check	745	
19-Feb-00	7:56	Check	727	
19-Feb-00	20:01	Check	725	
20-Feb-00	7:32	Check	691	
20-Feb-00	19:04	Check	692	
21-Feb-00	7:45	Check	761	
21-Feb-00	18:46	Check	661	
22-Feb-00	8:05	Check	799	
22-Feb-00	19:13	Check	668	
23-Feb-00	7:23	Check	730	
23-Feb-00	18:13	Check	650	
24-Feb-00	8:40	Check	867	
24-Feb-00	19:55	Check	675	
25-Feb-00	7:18	Check	683	
25-Feb-00	19:39	Check	741	
26-Feb-00	7:03	Check	684	
26-Feb-00	19:00	Check	717	
27-Feb-00	7:31	Check	751	
27-Feb-00	18:40	Check	669	
28-Feb-00	8:09	Check	809	

28-Feb-00	18:00	Pull	591	
29-Feb-00	8:00	Pull	840	Pull without Set or Check
29-Feb-00	19:10	Check	670	Check without Set
01-Mar-00	8:00	Check	770	
01-Mar-00	22:25	Check	865	
02-Mar-00	7:01	Check	516	
02-Mar-00	13:48	Check	407	
02-Mar-00	19:06	Check	318	
03-Mar-00	7:52	Check	766	
03-Mar-00	13:52	Check	360	
03-Mar-00	19:08	Check	316	
04-Mar-00	6:54	Check	706	
04-Mar-00	13:35	Check	401	
04-Mar-00	19:00	Check	325	
05-Mar-00	11:20	Check	980	
05-Mar-00	17:02	Check	342	
05-Mar-00	20:25	Check	203	
06-Mar-00	7:38	Check	673	
06-Mar-00	14:27	Check	409	
06-Mar-00	21:40	Check	433	
07-Mar-00	7:21	Check	581	
07-Mar-00	14:25	Check	424	
07-Mar-00	20:50	Check	385	
08-Mar-00	7:02	Check	612	
08-Mar-00	13:30	Check	388	
08-Mar-00	20:45	Check	435	
09-Mar-00	6:48	Check	603	
09-Mar-00	15:50	Check	542	
09-Mar-00	21:15	Check	325	
10-Mar-00	6:52	Check	577	
10-Mar-00	13:38	Check	406	
10-Mar-00	21:23	Check	465	
11-Mar-00	6:56	Check	573	
11-Mar-00	14:00	Check	424	
11-Mar-00	20:55	Check	415	
12-Mar-00	7:55	Check	660	
12-Mar-00	13:57	Check	362	
12-Mar-00	21:00	Check	423	
13-Mar-00	7:02	Check	602	
13-Mar-00	13:31	Check	389	
13-Mar-00	20:40	Check	429	
14-Mar-00	7:20	Check	640	
14-Mar-00	14:10	Check	410	
15-Mar-00	1:40	Check	690	
15-Mar-00	7:15	Check	335	

15-Mar-00	16:00	Check	525	
15-Mar-00	21:10	Check	310	
16-Mar-00	8:27	Check	677	
16-Mar-00	14:10	Check	343	
16-Mar-00	22:35	Check	505	
17-Mar-00	8:50	Check	615	
17-Mar-00	14:37	Check	347	
17-Mar-00	21:32	Check	415	
18-Mar-00	7:40	Check	608	
18-Mar-00	14:18	Check	398	
18-Mar-00	21:13	Check	415	
19-Mar-00	8:00	Pull	647	
19-Mar-00	13:50	Set	N/A	
19-Mar-00	15:00	Check	70	
19-Mar-00	20:20	Check	320	
20-Mar-00	7:45	Check	685	
20-Mar-00	14:15	Check	390	
20-Mar-00	20:13	Check	358	
21-Mar-00	7:25	Check	672	
21-Mar-00	15:46	Check	501	
21-Mar-00	21:10	Check	324	
22-Mar-00	7:18	Check	608	
22-Mar-00	13:20	Check	362	
22-Mar-00	21:07	Check	467	
23-Mar-00	7:48	Check	641	
23-Mar-00	13:23	Check	335	
23-Mar-00	21:55	Check	512	
24-Mar-00	8:05	Check	610	
24-Mar-00	13:55	Check	350	
24-Mar-00	20:56	Check	421	
25-Mar-00	7:44	Check	648	
25-Mar-00	14:07	Check	383	
25-Mar-00	21:17	Check	430	
26-Mar-00	7:44	Check	627	
26-Mar-00	13:55	Check	371	
26-Mar-00	20:40	Check	405	
27-Mar-00	8:00	Check	680	
27-Mar-00	13:55	Check	355	
27-Mar-00	21:25	Check	450	
28-Mar-00	7:12	Check	587	
28-Mar-00	13:57	Check	405	
28-Mar-00	20:32	Check	395	
29-Mar-00	7:15	Check	643	
29-Mar-00	13:26	Check	371	
29-Mar-00	21:45	Check	499	
30-Mar-00	7:24	Check	579	
30-Mar-00	13:35	Check	371	

30-Mar-00	22:30	Check	535	
31-Mar-00	7:48	Check	558	
31-Mar-00	13:45	Check	357	
31-Mar-00	20:42	Check	417	
01-Apr-00	7:27	Check	645	
01-Apr-00	14:05	Check	398	
01-Apr-00	20:49	Check	404	
02-Apr-00	9:50	Check	781	
02-Apr-00	14:10	Check	260	
02-Apr-00	20:55	Check	405	
03-Apr-00	7:10	Check	615	
03-Apr-00	14:05	Check	415	
03-Apr-00	21:30	Check	445	
04-Apr-00	7:34	Check	604	
04-Apr-00	14:01	Check	387	
04-Apr-00	20:56	Check	415	
05-Apr-00	8:11	Check	675	
05-Apr-00	13:30	Check	319	
05-Apr-00	20:56	Check	446	
06-Apr-00	7:23	Check	627	
06-Apr-00	13:35	Check	372	
06-Apr-00	20:48	Check	433	
07-Apr-00	7:50	Check	662	
07-Apr-00	14:04	Check	374	
07-Apr-00	20:55	Check	411	
08-Apr-00	7:10	Check	615	
08-Apr-00	14:03	Check	413	
08-Apr-00	20:34	Check	391	
09-Apr-00	7:03	Check	629	
09-Apr-00	13:49	Check	406	
09-Apr-00	20:53	Check	424	
10-Apr-00	7:23	Check	630	
10-Apr-00	13:32	Check	369	
10-Apr-00	20:17	Check	405	
11-Apr-00	6:56	Check	639	
11-Apr-00	13:45	Check	409	
11-Apr-00	20:38	Check	413	
12-Apr-00	7:23	Check	645	
12-Apr-00	13:20	Check	357	
12-Apr-00	20:27	Check	427	
13-Apr-00	7:15	Check	648	
13-Apr-00	17:40	Check	625	
14-Apr-00	0:19	Check	399	
14-Apr-00	10:40	Check	621	
14-Apr-00	15:13	Check	273	
15-Apr-00	1:26	Check	613	
15-Apr-00	8:20	Check	414	

15-Apr-00	15:40	Check	440	
16-Apr-00	0:17	Check	517	
16-Apr-00	8:06	Check	469	
16-Apr-00	15:53	Check	467	
16-Apr-00	23:00	Check	427	
17-Apr-00	14:11	Check	911	
17-Apr-00	21:56	Check	465	
18-Apr-00	5:00	Check	424	
18-Apr-00	10:14	Check	314	
18-Apr-00	14:55	Check	281	
18-Apr-00	21:25	Pull	390	
19-Apr-00	8:00	Pull	N/A	Pull without Set or Check
19-Apr-00	16:20	Pull	N/A	Pull without Set or Check
19-Apr-00	18:15	Set	115	
19-Apr-00	21:10	Check	175	
20-Apr-00	8:01	Check	651	
20-Apr-00	15:36	Check	455	
20-Apr-00	21:32	Check	356	
21-Apr-00	7:35	Check	603	
21-Apr-00	15:15	Check	460	
21-Apr-00	21:29	Check	374	
22-Apr-00	7:27	Check	598	
22-Apr-00	15:44	Check	497	
22-Apr-00	20:45	Check	301	
23-Apr-00	7:53	Check	668	
23-Apr-00	13:46	Check	353	
23-Apr-00	20:45	Check	419	
24-Apr-00	7:14	Check	629	
24-Apr-00	14:04	Check	410	
24-Apr-00	20:45	Check	401	
25-Apr-00	7:15	Check	630	
25-Apr-00	13:21	Check	366	
25-Apr-00	20:45	Check	444	
26-Apr-00	7:18	Check	633	
26-Apr-00	13:47	Check	389	
26-Apr-00	20:54	Check	427	
27-Apr-00	7:45	Check	651	
27-Apr-00	14:01	Check	376	
27-Apr-00	20:00		359	Unknown or missing TrapStatus
28-Apr-00	7:29	Check	689	
28-Apr-00	12:42	Check	313	
28-Apr-00	21:03	Check	501	
29-Apr-00	7:06	Check	603	
29-Apr-00	12:55	Check	349	

29-Apr-00	21:56	Check	541	
30-Apr-00	7:08	Check	552	
30-Apr-00	13:57	Check	409	
30-Apr-00	21:35	Check	458	
01-May-00	7:14	Check	579	
01-May-00	14:08	Check	414	
01-May-00	21:15	Check	427	
02-May-00	7:04	Check	589	
02-May-00	13:04	Check	360	
02-May-00	20:40	Check	456	
03-May-00	7:09	Check	629	
03-May-00	13:47	Check	398	
03-May-00	20:40	Check	413	
04-May-00	8:36	Check	716	
04-May-00	13:40	Check	304	
04-May-00	21:18	Check	458	
05-May-00	7:38	Check	620	
05-May-00	15:00	Check	442	
05-May-00	20:55	Check	355	
06-May-00	7:06	Check	611	
06-May-00	14:25	Check	439	
06-May-00	20:59	Check	394	
07-May-00	7:34	Check	635	
07-May-00	13:30	Check	356	
07-May-00	20:34	Check	424	
08-May-00	8:05	Check	691	
08-May-00	15:37	Check	452	
08-May-00	21:00	Check	323	
09-May-00	7:06	Check	606	
09-May-00	14:02	Check	416	
09-May-00	21:10	Check	428	
10-May-00	9:00	Check	710	
10-May-00	14:41	Check	341	
10-May-00	20:36	Check	355	
11-May-00	7:22	Check	646	
11-May-00	13:54	Check	392	
11-May-00	20:25	Check	391	
12-May-00	7:16	Check	651	
12-May-00	13:55	Check	399	
12-May-00	20:43	Check	408	
13-May-00	7:11	Check	628	
13-May-00	13:44	Check	393	
13-May-00	20:49	Check	425	
14-May-00	7:26	Check	637	
14-May-00	19:00	Check	694	
15-May-00	7:28	Check	748	
15-May-00	20:15	Check	767	

16-May-00	7:05	Check	650	
16-May-00	19:00	Check	715	
17-May-00	7:12	Check	732	
17-May-00	19:24	Check	732	
18-May-00	7:42	Check	738	
18-May-00	18:53	Check	671	
19-May-00	7:56	Check	783	
19-May-00	18:57	Check	661	
20-May-00	8:15	Check	798	
20-May-00	18:55	Check	640	
21-May-00	7:23	Check	748	
21-May-00	19:03	Check	700	
22-May-00	7:20	Check	737	
22-May-00	19:13	Check	713	
23-May-00	7:20	Check	727	
23-May-00	18:52	Check	692	
24-May-00	7:42	Check	770	
24-May-00	20:03	Check	741	
25-May-00	7:28	Check	685	
25-May-00	19:58	Check	750	
26-May-00	7:34	Check	696	
26-May-00	19:33	Check	719	
27-May-00	7:04	Check	691	
27-May-00	20:08	Check	784	
28-May-00	7:57	Check	709	
28-May-00	19:33	Check	696	
29-May-00	7:20	Check	707	
29-May-00	19:00	Check	700	
30-May-00	7:20	Check	740	
30-May-00	19:20	Check	720	
31-May-00	7:12	Check	712	
31-May-00	19:07	Check	715	
01-Jun-00	7:16	Check	729	
01-Jun-00	19:08	Check	712	
02-Jun-00	6:57	Check	709	
02-Jun-00	19:36	Check	759	
03-Jun-00	6:50	Check	674	
03-Jun-00	19:45	Check	775	
04-Jun-00	7:55	Check	730	
04-Jun-00	19:00	Check	665	
05-Jun-00	7:02	Check	722	
05-Jun-00	19:03	Check	721	
06-Jun-00	7:01	Check	718	
06-Jun-00	19:26	Check	745	
07-Jun-00	7:10	Check	704	
07-Jun-00	18:50	Check	700	
08-Jun-00	7:11	Check	741	

Appendix I

Trap status north trap 2000

08-Jun-00	18:35	Check	684	
09-Jun-00	7:00	Check	745	
09-Jun-00	18:36	Check	696	
10-Jun-00	6:30	Check	714	
10-Jun-00	19:56	Check	806	
11-Jun-00	7:03	Check	667	
11-Jun-00	19:03	Check	720	
12-Jun-00	7:13	Check	730	
12-Jun-00	17:56	Pull	643	

**Appendix I. Tuolumne South Trap (TU005N) Daily Status and Minutes Per Sampling Period.
Tuolumne River RST Survey 2000.**

Sample Date	Sample Time	Trap Status	Minutes Sampled	Anomaly
09-Jan-00	19:23	Set	N/A	Set without Pull
10-Jan-00	8:05	Check	762	
10-Jan-00	19:03	Check	658	
11-Jan-00	7:15	Check	732	
11-Jan-00	19:05	Check	710	
12-Jan-00	7:15	Check	730	
12-Jan-00	19:25	Check	730	
13-Jan-00	7:15	Check	710	
13-Jan-00	18:59	Check	704	
14-Jan-00	7:40	Check	761	
14-Jan-00	19:00	Pull	680	
16-Jan-00	18:48	Set	N/A	
17-Jan-00	8:04	Check	796	
17-Jan-00	18:52	Check	648	
18-Jan-00	7:20	Check	748	
18-Jan-00	20:18	Check	778	
19-Jan-00	8:55	Check	757	
19-Jan-00	19:00	Check	605	
20-Jan-00	8:17	Check	797	
20-Jan-00	19:00	Check	643	
21-Jan-00	8:35	Check	815	
21-Jan-00	19:05	Pull	630	
23-Jan-00	19:03	Set	N/A	
24-Jan-00	7:53	Check	770	
24-Jan-00	20:48	Check	775	
25-Jan-00	10:15	Check	807	
26-Jan-00	0:15	Check	840	
26-Jan-00	8:03	Check	468	
26-Jan-00	21:00	Check	777	
27-Jan-00	9:50	Check	770	
27-Jan-00	19:18	Check	568	
28-Jan-00	7:16	Check	718	
28-Jan-00	19:41	Pull	745	
30-Jan-00	18:40	Set	N/A	
31-Jan-00	8:34	Check	834	
31-Jan-00	19:55	Check	681	
01-Feb-00	7:30	Check	695	
01-Feb-00	18:33	Check	663	
02-Feb-00	8:46	Check	853	
02-Feb-00	18:47	Check	601	
03-Feb-00	6:43	Check	716	
03-Feb-00	20:05	Check	802	

04-Feb-00	7:05	Check	660	
04-Feb-00	17:50	Pull	645	
06-Feb-00	18:35	Set	N/A	
07-Feb-00	8:00	Check	805	
07-Feb-00	18:51	Check	651	
08-Feb-00	7:40	Check	769	
08-Feb-00	17:52	Check	612	
09-Feb-00	7:44	Check	832	
09-Feb-00	19:04	Check	680	
10-Feb-00	7:11	Check	727	
10-Feb-00	19:12	Check	721	
11-Feb-00	7:26	Check	734	
11-Feb-00	19:01	Pull	695	
13-Feb-00	19:09	Set	2888	
14-Feb-00	9:00	Check	831	
14-Feb-00	10:30	Pull	90	
14-Feb-00	19:45	Pull	N/A	Pull without Set or Check
15-Feb-00	7:45	Pull	N/A	Pull without Set or Check
15-Feb-00	21:50	Pull	N/A	Pull without Set or Check
16-Feb-00	6:50	Pull	N/A	Pull without Set or Check
16-Feb-00	19:00	Pull	N/A	Pull without Set or Check
17-Feb-00	7:50	Pull	N/A	Pull without Set or Check
17-Feb-00	22:15	Pull	N/A	Pull without Set or Check
18-Feb-00	7:24	Pull	N/A	Pull without Set or Check
18-Feb-00	19:49	Pull	N/A	Pull without Set or Check
19-Feb-00	7:56	Pull	N/A	Pull without Set or Check
19-Feb-00	20:01	Pull	N/A	Pull without Set or Check
20-Feb-00	8:15	Pull	N/A	Pull without Set or Check
20-Feb-00	19:10	Pull	N/A	Pull without Set or Check
21-Feb-00	7:10	Pull	N/A	Pull without Set or Check
21-Feb-00	18:30	Pull	N/A	Pull without Set or Check
22-Feb-00	7:25	Pull	N/A	Pull without Set or Check
22-Feb-00	19:00	Pull	N/A	Pull without Set or Check
23-Feb-00	7:10	Pull	N/A	Pull without Set or Check

23-Feb-00	14:00	Set	N/A	
23-Feb-00	18:35	Check	275	
24-Feb-00	7:28	Check	773	
24-Feb-00	20:26	Check	778	
25-Feb-00	7:55	Check	689	
25-Feb-00	19:04	Check	669	
26-Feb-00	7:34	Check	750	
26-Feb-00	18:35	Check	661	
27-Feb-00	7:08	Check	753	
27-Feb-00	18:54	Check	706	
28-Feb-00	9:36	Check	882	
28-Feb-00	18:00	Pull	504	
29-Feb-00	8:15	Pull	855	Pull without Set or Check
29-Feb-00	19:45	Check	690	Check without Set
01-Mar-00	8:41	Check	776	
01-Mar-00	21:37	Check	776	
02-Mar-00	7:28	Check	591	
02-Mar-00	13:15	Check	347	
02-Mar-00	19:30	Check	375	
03-Mar-00	7:13	Check	703	
03-Mar-00	13:38	Check	385	
03-Mar-00	18:51	Check	313	
04-Mar-00	7:03	Check	732	
04-Mar-00	13:10	Check	367	
04-Mar-00	18:42	Check	332	
05-Mar-00	7:00	Pull	738	
05-Mar-00	10:15	Set	N/A	
05-Mar-00	10:58	Check	43	
05-Mar-00	16:37	Check	339	
05-Mar-00	20:11	Check	214	
06-Mar-00	6:57	Check	646	
06-Mar-00	14:47	Check	470	
06-Mar-00	22:54	Check	487	
07-Mar-00	7:48	Check	534	
07-Mar-00	14:50	Check	422	
07-Mar-00	21:09	Check	379	
08-Mar-00	7:17	Check	608	
08-Mar-00	13:18	Check	361	
08-Mar-00	20:55	Check	457	
09-Mar-00	6:59	Check	604	
09-Mar-00	15:30	Check	511	
09-Mar-00	21:40	Check	370	
10-Mar-00	7:12	Check	572	
10-Mar-00	13:15	Check	363	
10-Mar-00	21:02	Check	467	

11-Mar-00	7:10	Check	608	
11-Mar-00	13:38	Check	388	
11-Mar-00	20:36	Check	418	
12-Mar-00	7:06	Check	630	
12-Mar-00	13:41	Check	395	
12-Mar-00	20:40	Check	419	
13-Mar-00	7:21	Check	641	
13-Mar-00	13:53	Check	392	
13-Mar-00	20:24	Check	391	
14-Mar-00	7:34	Check	670	
14-Mar-00	14:39	Check	425	
15-Mar-00	2:50	Check	731	
15-Mar-00	7:35	Check	285	
15-Mar-00	15:45	Check	490	
15-Mar-00	21:30	Check	345	
16-Mar-00	8:56	Check	686	
16-Mar-00	13:40	Check	284	
16-Mar-00	23:50	Check	610	
17-Mar-00	7:27	Check	457	
17-Mar-00	14:15	Check	408	
17-Mar-00	22:11	Check	476	
18-Mar-00	8:10	Check	599	
18-Mar-00	15:05	Check	415	
18-Mar-00	20:40	Check	335	
19-Mar-00	8:20	Check	700	
19-Mar-00	14:16	Check	356	
19-Mar-00	19:38	Check	322	
20-Mar-00	8:00	Check	742	
20-Mar-00	15:15	Check	435	
20-Mar-00	22:47	Check	452	
21-Mar-00	8:31	Check	584	
21-Mar-00	15:08	Check	397	
21-Mar-00	20:50	Check	342	
22-Mar-00	7:35	Check	645	
22-Mar-00	12:40	Check	305	
22-Mar-00	21:25	Check	525	
23-Mar-00	8:11	Check	646	
23-Mar-00	13:10	Check	299	
23-Mar-00	22:33	Check	563	
24-Mar-00	7:16	Check	523	
24-Mar-00	13:34	Check	378	
24-Mar-00	20:36	Check	422	
25-Mar-00	8:03	Check	687	
25-Mar-00	13:39	Check	336	
25-Mar-00	20:45	Check	426	
26-Mar-00	8:10	Check	685	
26-Mar-00	13:45	Check	335	

26-Mar-00	20:47	Check	422	
27-Mar-00	8:14	Check	687	
27-Mar-00	13:35	Check	321	
27-Mar-00	21:47	Check	492	
28-Mar-00	7:48	Check	601	
28-Mar-00	14:04	Check	376	
28-Mar-00	20:41	Check	397	
29-Mar-00	7:25	Check	644	
29-Mar-00	13:05	Check	340	
29-Mar-00	21:12	Check	487	
30-Mar-00	7:49	Check	637	
30-Mar-00	13:03	Check	314	
30-Mar-00	22:55	Check	592	
31-Mar-00	7:10	Check	495	
31-Mar-00	13:11	Check	361	
31-Mar-00	20:56	Check	465	
01-Apr-00	8:12	Check	676	
01-Apr-00	13:36	Check	324	
01-Apr-00	21:09	Check	453	
02-Apr-00	8:58	Check	709	
02-Apr-00	13:58	Check	300	
02-Apr-00	21:17	Check	439	
03-Apr-00	7:25	Check	608	
03-Apr-00	14:00	Check	395	
03-Apr-00	21:45	Check	465	
04-Apr-00	7:42	Check	597	
04-Apr-00	14:15	Check	393	
04-Apr-00	20:35	Check	380	
05-Apr-00	8:12	Check	697	
05-Apr-00	12:58	Check	286	
05-Apr-00	21:17	Check	499	
06-Apr-00	7:41	Check	624	
06-Apr-00	13:15	Check	334	
06-Apr-00	21:06	Check	471	
07-Apr-00	7:10	Check	604	
07-Apr-00	13:50	Check	400	
07-Apr-00	20:42	Check	412	
08-Apr-00	7:45	Check	663	
08-Apr-00	13:37	Check	352	
08-Apr-00	20:23	Check	406	
09-Apr-00	6:44	Check	621	
09-Apr-00	13:40	Check	416	
09-Apr-00	20:44	Check	424	
10-Apr-00	7:42	Check	658	
10-Apr-00	13:40	Check	358	
10-Apr-00	20:30	Check	410	
11-Apr-00	7:03	Check	633	

11-Apr-00	13:37	Check	394	
11-Apr-00	20:45	Check	428	
12-Apr-00	7:30	Check	645	
12-Apr-00	13:30	Check	360	
12-Apr-00	20:40	Check	430	
13-Apr-00	8:02	Check	682	
13-Apr-00	17:50	Check	588	
14-Apr-00	1:06	Check	436	
14-Apr-00	8:54	Check	468	
14-Apr-00	15:37	Check	403	
14-Apr-00	23:05	Check	448	
15-Apr-00	7:35	Check	510	
15-Apr-00	16:43	Check	548	
15-Apr-00	23:30	Check	407	
16-Apr-00	7:51	Check	501	
16-Apr-00	16:14	Check	503	
16-Apr-00	23:30	Check	436	
17-Apr-00	7:45	Check	495	
17-Apr-00	22:14	Check	869	
18-Apr-00	4:10	Check	356	
18-Apr-00	10:45	Check	395	
18-Apr-00	14:38	Check	233	
18-Apr-00	21:12	Check	394	
19-Apr-00	7:42	Check	630	
19-Apr-00	16:20	Check	518	
19-Apr-00	22:40	Check	380	
20-Apr-00	9:40	Check	660	
20-Apr-00	15:50	Check	370	
20-Apr-00	22:17	Check	387	
21-Apr-00	7:47	Check	570	
21-Apr-00	15:25	Check	458	
21-Apr-00	20:59	Check	334	
22-Apr-00	8:10	Check	671	
22-Apr-00	15:55	Check	465	
22-Apr-00	20:25	Check	270	
23-Apr-00	7:07	Check	642	
23-Apr-00	13:57	Check	410	
23-Apr-00	21:00	Check	423	
24-Apr-00	7:50	Check	650	
24-Apr-00	13:44	Check	354	
24-Apr-00	21:05	Check	441	
25-Apr-00	7:28	Check	623	
25-Apr-00	13:00	Check	332	
25-Apr-00	20:25	Check	445	
26-Apr-00	7:38	Check	673	
26-Apr-00	14:00	Check	382	
26-Apr-00	21:03	Check	423	

27-Apr-00	8:00	Check	657	
27-Apr-00	14:15	Check	375	
28-Apr-00	6:59	Check	1004	
28-Apr-00	12:55	Check	356	
28-Apr-00	20:34	Check	459	
29-Apr-00	7:34	Check	660	
29-Apr-00	13:02	Check	328	
29-Apr-00	21:22	Check	500	
30-Apr-00	7:32	Check	610	
30-Apr-00	13:43	Check	371	
30-Apr-00	21:47	Check	484	
01-May-00	7:31	Check	584	
01-May-00	14:12	Check	401	
01-May-00	21:30	Check	438	
02-May-00	7:26	Check	596	
02-May-00	13:24	Check	358	
02-May-00	20:25	Check	421	
03-May-00	7:29	Check	664	
03-May-00	13:56	Check	387	
03-May-00	20:23	Check	387	
04-May-00	8:35	Check	732	
04-May-00	13:07	Check	272	
04-May-00	21:42	Check	515	
05-May-00	7:48	Check	606	
05-May-00	15:11	Check	443	
05-May-00	21:16	Check	365	
06-May-00	7:54	Check	638	
06-May-00	14:05	Check	371	
06-May-00	21:16	Check	431	
07-May-00	7:51	Check	635	
07-May-00	13:44	Check	353	
07-May-00	20:50	Check	426	
08-May-00	8:25	Check	695	
08-May-00	15:47	Check	442	
08-May-00	21:15	Check	328	
09-May-00	7:26	Check	611	
09-May-00	14:10	Check	404	
09-May-00	21:16	Check	426	
10-May-00	9:39	Check	743	
10-May-00	15:17	Check	338	
10-May-00	20:50	Check	333	
11-May-00	7:55	Check	665	
11-May-00	14:08	Check	373	
11-May-00	20:30	Check	382	
12-May-00	7:40	Check	670	
12-May-00	14:07	Check	387	
12-May-00	20:50	Check	403	

13-May-00	7:28	Check	638	
13-May-00	13:53	Check	385	
13-May-00	20:58	Check	425	
14-May-00	7:43	Check	645	
14-May-00	19:15	Check	692	
15-May-00	7:08	Check	713	
15-May-00	20:25	Check	797	
16-May-00	6:20	Check	595	
16-May-00	19:23	Check	783	
17-May-00	7:30	Check	727	
17-May-00	19:43	Check	733	
18-May-00	8:42	Check	779	
18-May-00	19:01	Check	619	
19-May-00	9:06	Check	845	
19-May-00	19:18	Check	612	
20-May-00	7:29	Check	731	
20-May-00	19:10	Check	701	
21-May-00	7:53	Check	763	
21-May-00	19:22	Check	689	
22-May-00	8:00	Check	758	
22-May-00	19:30	Check	690	
23-May-00	7:57	Check	747	
23-May-00	19:11	Check	674	
24-May-00	8:04	Check	773	
24-May-00	20:25	Check	741	
25-May-00	7:47	Check	682	
25-May-00	20:31	Check	764	
26-May-00	7:47	Check	676	
26-May-00	19:04	Check	677	
27-May-00	7:12	Check	728	
27-May-00	19:09	Check	717	
28-May-00	8:12	Check	783	
28-May-00	19:00	Check	648	
29-May-00	7:30	Check	750	
29-May-00	19:15	Check	705	
30-May-00	7:30	Check	735	
30-May-00	19:47	Check	737	
31-May-00	7:31	Check	704	
31-May-00	19:32	Check	721	
01-Jun-00	7:25	Check	713	
01-Jun-00	19:18	Check	713	
02-Jun-00	7:05	Check	707	
02-Jun-00	20:01	Check	776	
03-Jun-00	7:04	Check	663	
03-Jun-00	19:08	Check	724	
04-Jun-00	8:10	Check	782	
04-Jun-00	19:00	Check	650	

05-Jun-00	7:18	Check	738	
05-Jun-00	19:14	Check	716	
06-Jun-00	7:12	Check	718	
06-Jun-00	19:41	Check	749	
07-Jun-00	7:20	Check	699	
07-Jun-00	19:01	Check	701	
08-Jun-00	7:26	Check	745	
08-Jun-00	18:48	Check	682	
09-Jun-00	7:25	Check	757	
09-Jun-00	18:55	Check	690	
10-Jun-00	7:01	Check	726	
10-Jun-00	19:04	Check	723	
11-Jun-00	7:44	Check	760	
11-Jun-00	19:51	Check	727	
12-Jun-00	7:55	Check	724	
12-Jun-00	18:45	Pull	650	

Appendix II. Fish Species Captures Per Day. Tuolumne River RST Survey 1999-2000.

Organism Codes for all species captured native and non-native

AMS	American Shad	RES	Redear sunfish
BGS	Bluegill	RFS	Riffle sculpin
BKB	Black bullhead	RSN	Red shiner
BKS	Black crappie	SASQ	Sacramento squawfish
BRB	Brown bullhead	SASU	Sacramento sucker
C	Carp	SCB	Sacramento blackfish
CHC	Channel catfish	SMB	Smallmouth bass
CHN	Chinook	SPLT	Splittail
FHM	Fathead minnow	STB	Striped bass
GF	Goldfish	TFS	Threadfin shad
GSF	Green sunfish	TP	Tule perch
GSN	Golden shiner	UNCF	Unknown catfish
HCH	Hitch	UNCN	Unknown centrarchid
HH	Hardhead	UNCP	Unknown cyprinid
KBL	Kern Brook Lamprey	UNLP	Unknown lamprey
LMB	Largemouth bass	UNLPA	Unknown lamprey ammocete
MQF	Mosquito fish	UNK	Unknown
MSS	Inland silverside	W	Warmouth
PL	Pacific lamprey	WHC	White catfish
WHS	White crappie	WST	White sturgeon
PRS	Prickly sculpin	RBT	Rainbow trout

Appendix II. Native Fish Species Captures Per Day. Tuolumne River RST Survey 1999.

Sample Date	Organism Codes							
	HCH	PL	PRS	RFS	SASQ	SASU	SCB	SPLT
1/13/99		1		1				
1/15/99		1						
1/18/99		1						
1/19/99		21						
1/20/99		9						
1/21/99		279						
1/22/99		15	4					
1/23/99		15						
1/24/99		31						
1/25/99		2						
1/26/99		3	1					
1/27/99		8						
1/28/99		3						
1/29/99		2						
1/30/99		1						
1/31/99		2						
2/1/99		7						
2/2/99		6						
2/3/99		13						
2/4/99		3						
2/5/99		2						
2/6/99		2						
2/7/99		1						
2/10/99		1						
2/11/99		35	1					
2/12/99		1						
2/15/99		2						
2/16/99		3	1					
2/18/99		2						
2/19/99		1						
2/22/99								
2/23/99		1	1					
2/24/99		3						
2/25/99		1	2					
2/26/99		2	1					
2/28/99		1						
3/1/99		1						
3/2/99		2						
3/3/99		3						
3/4/99		7						
3/7/99		1						
3/8/99		1						
3/9/99		2						
3/10/99		1						
3/11/99		2						
3/12/99		1						
3/14/99		3						

Appendix II

Native species captures 1999

Sample Date	HCH	PL	PRS	RFS	SASQ	SASU	SCB	SPLT
3/15/99		2						
3/16/99		5			1			
3/17/99		1						
3/18/99		1						
3/19/99		1						
3/20/99		2						
3/21/99		2						
3/22/99		2						
3/23/99		2						
3/24/99		2						
3/25/99								
3/26/99		2						
3/27/99								
3/28/99		2						
3/29/99								
3/30/99		1						
4/1/99								
4/2/99								
4/3/99		1						
4/4/99		3						
4/5/99		1						
4/6/99		6						
4/7/99		1	1					
4/8/99		3				1		
4/9/99		2		1				
4/10/99		3						
4/11/99		3						
4/12/99		3						
4/13/99		1						
4/14/99								
4/15/99								
4/16/99		2						
4/17/99								
4/18/99								
4/19/99								
4/20/99								
4/21/99								
4/22/99		1				1		
4/23/99		1				1		
4/24/99		1						
4/25/99		3						
4/26/99		1						
4/27/99		1						
4/28/99		8				1		
4/29/99		109	1			2		
4/30/99		17				1		
5/1/99		1						
5/2/99		2	6			21		
5/3/99		2	3			3		
5/4/99		10	4					

Appendix II

Non-native fish species 1999

Appendix II

Non-native fish species 1999

Sample Date	BGS	BKB	BKS	BRB	C	CHC	GF	GSF	GSN	LMB	MQF	MSS	RES	RSN	SMB	STB	TFS	W	WHC	WHS
5/5/99																			1	
5/6/99																			2	
5/7/99																			2	
5/8/99																			4	
5/9/99																			4	
5/10/99																			1	
5/11/99																			3	
5/12/99																			2	
5/13/99																			2	
5/14/99																			2	
5/16/99																			2	
5/17/99																			2	
5/18/99	2								1										6	
5/19/99																			5	
5/20/99	1																		4	
5/21/99																			1	
5/22/99	2																	1		5
5/23/99									1										1	
5/24/99									1										5	
5/25/99																	1		4	
5/26/99	1																		3	
5/27/99									2										3	
5/28/99																			3	
5/29/99																			1	
5/30/99							1		1										4	
5/31/99	1	2	2														1		1	
6/1/99	1	1							1											
6/2/99	1																		1	
6/3/99	1																		2	
6/4/99	1																		1	
6/5/99			2																2	
6/6/99	1																		1	3
6/7/99												1	1						2	3
6/8/99																			1	
6/9/99	1		3																4	5
6/10/99		1	1													1	1		2	1
6/11/99																		1	1	
6/12/99																			4	
6/13/99																			4	
6/14/99	1		18					1											3	
6/15/99	3		1					2				1	2							1
6/16/99	2		3					4				2						1	1	
6/17/99	1		2										5						6	2
6/18/99			2		2								2						16	
Grand Total	80	5	41	2	4	15	5	7	6	26	1	7	1	2	2	2	4	2	198	21

Appendix II. Native Fish Species Captures Per Day. Tuolumne River RST Survey 2000.

Sample Date	Organism Codes								
	HCH	HH	PL	PRS	RBT	SASQ	SASU	SCB	SPLT
1/10/00			2						
1/11/00			1						
1/12/00		1	4			1			
1/13/00			1				4		
1/14/00									
1/17/00									
1/18/00		1	15						
1/19/00			5						
1/20/00			4	1					
1/21/00			2	1					
1/24/00			50	1					
1/25/00			23						
1/26/00			38	2					
1/27/00			102	1				2	
1/28/00			4					3	
1/31/00				1					
2/1/00	3		1						
2/2/00									
2/3/00								1	
2/4/00									
2/7/00									
2/8/00			1						
2/9/00			4						
2/10/00			1						
2/11/00			4	2					
2/14/00			15						
2/15/00			4						
2/16/00			158			1			
2/17/00			2						
2/18/00			1			3			
2/19/00			46			20			
2/20/00							4	2	1
2/21/00			17		1				
2/22/00			30	1				2	
2/23/00							2	1	
2/24/00			1					2	
2/25/00			2			2		2	
2/26/00			3					1	
2/27/00			1			2		2	
2/28/00			7			1			
2/29/00							1		
3/1/00							1		
3/2/00								3	
3/3/00			1						
3/4/00			1			1		1	

Appendix II

Native fish species 2000

Sample Date	HCH	HH	PL	PRS	RBT	SASQ	SASU	SCB	SPLT
3/5/00			1			1			
3/6/00							1		
3/7/00			3			5	1		
3/8/00						1	1		
3/9/00						3			
3/10/00			1				2		
3/11/00			2			10	1		
3/12/00						9	2		
3/13/00			1			3			
3/14/00			2			6			
3/15/00			5			38	4		
3/16/00	4	5				15	3		
3/17/00			4			16	3		
3/18/00			9			14	3		
3/19/00			2			15			
3/20/00			18			24	4		
3/21/00			9			34	11		
3/22/00			7			30	15		
3/23/00						18	8		
3/24/00			2			15	3		
3/25/00			1			8	3		
3/26/00			2					1	
3/27/00			1			1	1		
3/28/00									
3/29/00									
3/30/00							1		
3/31/00			1						
4/1/00			1			1	1		
4/2/00						3			
4/3/00						3		2	
4/4/00						2	1	2	
4/5/00						3			
4/6/00			1			3			
4/7/00						1			
4/8/00						3	1		
4/9/00									
4/10/00									
4/11/00									
4/12/00						2			
4/13/00									
4/14/00			25						
4/15/00			21			3	1		
4/16/00						2			
4/17/00			7						
4/18/00			15			1			
4/19/00							7		
4/20/00			1			10	2		

Appendix II

Native fish species 2000

Appendix II

Native fish species 2000

Sample Date	HCH	HH	PL	PRS	RBT	SASQ	SASU	SCB	SPLT
6/7/00									
6/8/00									1
6/9/00									2
6/10/00				1		1			2
6/11/00									
6/12/00						1			2
Grand Total	3	6	712	14	1	376	120	13	13

Appendix II. Non-native fish species captures per day. Tuolumne River RST Survey 2000.

Sample Date	Organism Codes																				
	AMS	BGS	BKS	C	CHC	GF	GSE	GSN	LMB	MQF	MSS	RBA	RES	RSN	SMB	SPB	STB	TFS	W	WHC	WHS
1/10/00		1													1						
1/11/00		1									2			6				1		3	
1/12/00		1		1					1					6						3	
1/13/00		7									1			3						2	
1/14/00			1																	1	
1/17/00		2																		3	
1/18/00		4		-1						1	1									4	
1/19/00		5		1				2	8											4	
1/20/00		4		2				2	2											6	
1/21/00		11		1				3	1											3	
1/24/00		26		1					13											21	
1/25/00		142							66											8	
1/26/00	1	18						1	52	1	3									6	
1/27/00		67						29	84	1	8				9					3	
1/28/00		51		3				5	20		1		1					1		2	
1/31/00		47		1					2	2					5					2	
2/1/00	1	26						2	1											2	
2/2/00		21						1	1	1					2					7	
2/3/00		12							1											4	
2/4/00		2						2												5	
2/7/00		14						3							1				9	2	
2/8/00		6						3											4	3	
2/9/00		4						1						1						5	
2/10/00		7		2							1							1		5	
2/11/00		10																		12	
2/14/00		7						4							4			15		5	
2/15/00								2										1		1	
2/16/00	1	1		1							1									2	
2/17/00		1		125				1	1		2				2	1				3	
2/18/00														1							
2/19/00		1							1		3				1					1	
2/20/00		1									1			1						1	
2/21/00				1					1		2	2						2		1	
2/22/00				1																	
2/23/00		1																		1	
2/24/00		3								2	1									2	
2/25/00								1		1			1			1				2	
2/26/00								1		1								2			
2/27/00		1						1		2										2	
2/28/00				1																1	
2/29/00		2								2	1										
3/1/00		1								1								2		1	
3/2/00					1					2								1		2	
3/3/00									1									1		1	

Appendix II

Non-native fish species 2000

Sample Date	AMS	BGS	BKS	C	CHC	GF	GSF	GSN	LMB	MQF	MSS	RBA	RES	RSN	SMB	SPB	STB	TFS	W	WHC	WHS
3/4/00					2																
3/5/00																					
3/6/00								1										2		1	
3/7/00											1			1					1		
3/8/00	1											1									
3/9/00	1				1	1				2										1	
3/10/00										1				1		1					
3/11/00											1										
3/12/00									3	2									2		
3/13/00						1		4		2				1				1		1	
3/14/00										1								2			
3/15/00	2	1								3	11							5		1	
3/16/00											9								8		
3/17/00									1	1	4							4			
3/18/00										1	6							5		1	
3/19/00	1						3											2			
3/20/00										1					1			22			
3/21/00	2										1				1			16		1	
3/22/00	3				1					2	5			2	2	3		2		1	
3/23/00	6		1						2	1	1			2		2		1		8	
3/24/00	2							2	3		1							4		7	
3/25/00	4			1														26		8	
3/26/00	2							1			1				1			3		3	
3/27/00	3		1					5			3					1		3		1	
3/28/00	4																	3		2	
3/29/00	1		1				2		1									2			
3/30/00	2										1							2		1	
3/31/00	1							1			1								4		
4/1/00	2		1								1									3	
4/2/00	1					1	1												5		
4/3/00	8							6			1								5		
4/4/00	2		1	1				1	1						2	1		2		5	
4/5/00	4		3							2									1	12	
4/6/00	4	1	1					2		1						1				10	
4/7/00	4		1				4						1							9	
4/8/00	8		2				2		1					1					13		
4/9/00	5		1															1		4	
4/10/00			1		1	3			2											11	
4/11/00	3		1		1	1														8	
4/12/00	3		2							1				3	1			1		17	
4/13/00			1						2				1					1		9	
4/14/00	2								1		2							5		7	
4/15/00	2															2	4			1	
4/16/00	2									1					1			4			
4/17/00		1							2											1	
4/18/00				1										1			8			1	
4/19/00										1					1			1		4	

Appendix II

Non-native fish species 2000

Sample Date	AMS	BGS	BKS	C	CHC	GF	GSF	GSN	LMB	MQF	MSS	RBA	RES	RSN	SMB	SPB	STB	TFS	W	WHC	WHS
4/20/00		4			1		2	1		2	1							6		12	
4/21/00		3			1				5	1	1	1						5		13	
4/22/00		6							1	1	2							1	1	10	
4/23/00		2					1													9	
4/24/00		1								1				1				6		4	
4/25/00		2																		2	
4/26/00																				2	
4/27/00								1							2					3	
4/28/00																				5	
4/29/00		1						1							1					4	
4/30/00		1							1											5	
5/1/00		3			1					1					1			1		5	
5/2/00		2			2													1		1	
5/3/00								1												2	
5/4/00		3																3		5	
5/5/00		1																4		7	
5/6/00																		3		6	
5/7/00		1						1										2		6	
5/8/00									1						1			1		4	
5/9/00		1												1	2		1		1		2
5/10/00		1			1			1										40	1	2	
5/11/00							1				1					1		5		4	
5/12/00									1		1							1		6	
5/13/00							1		1		1				1			2		2	
5/14/00		2													2					2	
5/15/00		1						1	5						1					1	
5/16/00		2							1	6		3					3	20		5	
5/17/00			2	1						7		3			3	10	2		7	1	5
5/18/00			1	1				2	3	1					3		3	1	4	10	
5/19/00		3	1	3				5	8	2					3	3	1		22	14	2
5/20/00		2						3	1	3					1				2		16
5/21/00			2					5	2	1								17	1	11	
5/22/00									42	3				1	3			26	1	19	1
5/23/00		2		1						6	1							8		19	1
5/24/00			1					1	2							31		6		7	
5/25/00				1					7		1							1		4	
5/26/00		1		1											1			2	1	5	
5/27/00									4	1					1			1		3	
5/28/00								1	3									1		3	
5/29/00									1						1					7	
5/30/00		2			1			3	2						2					1	
5/31/00		2							3						1	2				5	
6/1/00															2					5	
6/2/00		1		1	1			1	2						1					5	
6/3/00		1			3										3					4	1
6/4/00															1	5				9	
6/5/00															2						

Appendix II

Non-native fish species 2000

Sample Date	AMS	BGS	BKS	C	CHC	GF	GSF	GSN	LMB	MQF	MSS	RBA	RES	RSN	SMB	SPB	STB	TFS	W	WHC	WHS
6/6/00				1						2	1			1						2	
6/7/00	1									2										2	
6/8/00								1	1					1	2					4	
6/9/00		1						1	1					1						4	
6/10/00								4						2						10	
6/11/00								4	1		2	1		2				2		13	
6/12/00		1							1	2										21	
Grand Total	4	646	1	11	185	6	8	151	379	72	95	1	4	74	64	50	4	369	8	654	10

